ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE, TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

Vol. 8. No. 5. WEEKLY. | NEW YORK, SATURDAY, APRIL 3, 1886. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

New Galvanometer and Rheostat.

We illustrate on this page a combined galvanometer and rheostat, for which a patent has recently been allowed to R. H. Mather, of Hartford, Conn. This instrument presents some novel features both of construction and of operation. A general idea of its construction can be obtained from the cut. Of the four binding-posts, at the top of the figure, the two on the right are used for the battery, and the other two for the resistance which is to be measured. Each of the circular cap-plates is pivoted over a series of index figures showing the resistances of the corresponding resistance coils, which are arranged below. Through a hole in a single cap-plate the observer can read only that index figure which shows the number of ohms, or tens, or, as the case may be, the hundreds or thousands of ohms of resistance in circuit at the time of the observation.

The coil which surrounds the needle is wound differentially, according to the magnitude of the resistances to be measured.

In using this instrument the cap-plates are severally turned to that position in which the needle is brought to zero, and then the resistance is read, through the several cap-plates, in thousands, hundreds, tens and units of ohms.

A striking peculiarity of this device, regarded as a rheostat, consists in the fact that the indicated resistances can be read correctly, and cannot be read incorrectly by any observer, however unskilled in electrical measurements.

Regarded as a galvanometer it possesses an additional advantage in the circumstance that the instrument does not require to be leveled up; for the needle points to zero with equal facility, whatever be the position of the instrument. At the same time the vibration of the needle is reduced to a minimum, as in other so-called dead-beat galvanometers.

This device is peculiarly adapted to be used in the presence of dynamos, for it is so constructed as to be unaffected by the proximity of even the strongest magnets. The manufacture of these instruments is comparatively inexpensive, and, for every-day practical work, they cannot fail to be in great demand. This is indicated by the favor with which they have been received by electricians in different parts of the country, as well as by the obvious merits of the invention.

Electricity in Medicine. (1)

It may be claimed that electricians, properly so called, are always interested in everything which is truly scientific, but these gentlemen are in the habit of handling large machines, and manipulating hundreds of volts and amperes; they constantly put in action collossal forces, so, when we (physicians) show them our apparatus, which only generate minute fractions of an ampere, they disdainfully scorn what they term scientific playthings, and often consider them beneath their notice as electricians.

It is too true, on the other hand, that charlatanism has profited by the infatuation of the day, and hatched up a great variety of assumed medical apparatus. With a large proportion of the faculty an electrical appliance is simply a lot of wire terminals leading from couples of zinc and copper, capable of various combinations of quantity and tension, that is all.

From an electrical standpoint there are two grand divisions or classes of physicians, skeptics and believers. The former is by far the larger class, and is not made up solely of the old school; there are many in the ranks who belong to a younger generation. The cause of this unbelief is found in the fact that proper knowledge of medical electricity does not exist among the faculty.

Our hospital experience has shown us all how electrical apparatus is applied in these establishments. They are, to begin with, but sparsely supplied with proper appliances, and these are so little cared for as often to be practically useless.

The surgeon-in-chief orders applications of electricity for some patient, the chief assistant has not the time to attend to it; he has examinations to manipulate, observations to make, and so he, in turn, gives the order to an inferior, and he to the steward, or perhaps to the assistant of this officer, and he, thinking the matter of little or no consequence, furnishes the patient with the no-account accessories, and permits him to practice upon himself. It is, perhaps, applied for a day or two, and the treatment is abandoned.

It is easy to comprehend how the army of skeptics is recruited from the faculty staff and from the ranks of the students.

The believers may be subdivided into those who are earnest devotees, and those whom I call dangerous volunteers.

The world at large is anxious for, and loves results, while it cares but little for the means by which these are attained, It is so greedy for accomplished facts that it is willing to believe in marvelous means. If one believes in and respects electrical accomplishments, it is because of the mystery surrounding an enormous power which may be controlled by man—the energy of which may be measured with a compass and weighed in a balance; but he is a volunteer believer in its marvelous character, as he would believe in spiritualism or in a miracle.

The people must have facts—the practitioner must seek the *rationale* of results.

One portion of the human organism is purely *vegetative*—it includes the organs of nutrition, respiration, circulation, and reproduction. A second division comprises the organs of *relation*—those which permit of movement, conversation, communication of thought by gestures, etc. The *intelligence* or mental portion—brain action—comprises a third division. In one individual the development of faculties pertaining to this part of the human economy governs the hand of the painter, and again, it educates the savage in the hurling of darts and other rude methods of life labor.

New Galvanometer and Rheostat, Invented by R. H. Mather, of Hartford.

These three divisions are intimately connected, and, to an extent, each may exert controlling influences upon the others. The deranged stomach of the dyspeptic finds a sympathetic friend in the brain, which seems to endeavor to bear part of its uncomfortable burthen.

But this electricity—that force which is so applicable, and may influence each of these members of this human trinity—how, after it has pointed out a weak spot in any one of these, how can it be applied to induce relief or effect a cure?

Connected with the brain through the spinal cord are routes for three modes of communication. The motor nerves, the nerves of sensation, and the ganglionic nerves, which serve to direct all involuntary motion and action, to maintain and renew the organism by keeping up the flow of blood, supplying the fuel, assimilating the food, removing the waste, etc. Derangements of these several divisions of the nervous systems have each their individual indications. Let us see how electricity may be made to affect some of these disturbed conditions.

First, by static electricty. We place the patient upon an insulated stool, and commence charging his person with electricity from a plate machine. The radiation from his body is constantly replaced by the machine, and the patient is in a sort of electrical bath.

The immediate action of this electrisation is upon the nerves of the skin, and in that class of disease where the skin is abnormally dry, insensible and cold, sensation and circulation are rapidly restored.

But while the action is primarily at the surface a secondary effect is found in internal reactions which are invaluable the determination of certain general affections.

Thus, in cases of depression or extreme nervous sensibility an improvement is immediately apparent when the skin assumes its proper functions. Females thus afflicted are daily raised from a condition of organic torpidity much more certainty and in less time than by the use of iron and other medical prescriptions.

A farther proof of the reaction on the central nerves by this method is shown in its somnolent effects. A subject suffering from insomnia is generally cured at the end of the fourth or fifth day; this effect is the first phenomena which our patients observe, and they hail with pleasure this primary result.

But the empioyment of static electricity is not limited to this class of symptoms. Its effects may be localized upon some given point on the surface of the body, by means of a pointed rod held at some distance, or with metallic balls of divers dimensions.

In the first case a continuous discharge is effected, and the accompanying sensation is that of a gentle breeze, technically called an electric wind. In the second the discharge is sudden, a spark, the noise and the excitation proportioned to the capacity of the apparatus used.

The former is employed with success in neuralgia and chorea, and the majority of the involuntary movements accompanying muscular contractions.

The spark, on the contrary, is useful as a more local excitant which may be limited in its application to the cuticle in cases of rheumatism, partial paralysis or insensibility, or, if need be, made to penetrate deeper in the tissues of the system.

In addition to these methods, which employ minute quantities of electricity of extremely high tension, we have Faradaic electrisation—induced electricity, or that of interrupted currents. The constant abuse of this form of current as a remedial agent I must solemnly protest against—it is productive of more harm than good, yet the small induction coil is the apparatus found upon the tables of the majority of practitioners.

There are two varieties of induction coils which are at the hands of the physician. One of these constructed of fine wire of great length, gives us extremely high tension with a very minute quantity of current; another of larger and shorter wire produces greater quantity of much lower tension.

With the first of these a sudden and startling effect may be produced upon a given point on the cuticle, as where the nerve approaches the surface in neuralgia. This was the practice of Duchenne, of Boulogne. In the hands of a skillful electrician good has often resulted from its use, but always at the expense of severe pain. It is more objectional than blistering, burning or similar

treatment, and it is not unfrequently necessary to administer chloroform when it is to be applied.

The effect of the second form of induction coil is to produce muscular motion; its action is purely mechanical. The force of the shock is like that of a brusque blow applied to the muscle or the motor nerve, for its duration is but the one-four-thousanths of a second. These shocks may be repeated more or less rapidly, the repetitions being capable of any rate up to several hundreds per second.

But this hammering of the nerves is too often overdone, resulting in fatigue and exhaustion of the nervous system and the muscular tissue.

The small wire bobbins I seldom use, save in cases where I deem a very marked revulsion of the skin necessary or in the treatment of cutaneous anesthesia. The larger wire bobbins are mostly useful in diagnosis; for therapeutic purposes I prefer to substitute, and do so with success, either a galvanic shock or the discharge from a condenser.

We have now arrived at the galvanic current—a battery current—which in my belief embraces the largest number of cases in its applicability. It constitutes a reservoir of electricity which furnishes in a given time a considerable quantity of energy, capable of many transformations. It is readily transformed into heat, light, motion; and is capable of producing divers combinations and chemical decompositions.

I have already spoken of the production of muscular movement by galvanic excitation. To effect this it is only necessary to discharge the current of a battery of sufficient capacity through the muscles or motor nerves. This method is not only a valuable means of exploration, but it has the additional advantage of being painless, and permits of a thorough calculation of the energy employed. Its chief value, however, resides in its chemical action.

A current is passed through a chemical solution. Decomposition and recomposition results. If we pass this current through the human body, which contains most complex chemical solutions and combinations, all these being good conductors, the current works changes in these, new combinations are formed, and the nervous force is more or less modified.

It is easy to comprehend how important this class of transformation may prove in muscular atrophy or in paralysis. In the first instance the chemical action set up by the current permits the muscular machine to chemically reconstruct its tissue, and the increasing dimensions of these parts may be noted by periodical measurements. After proper treatment for the space of one month, we often see that the atrophied member has gained from one to two one-hundreths of a meter in circumference.

Molecular movement is readily appreciable in cases of rheumatism, some forms of tumor, etc. I cannot cite here all the circumstances in which the galvanic current acts certainly by chemical effects.

As to the action of the current on the nervous force, I think that this is attributable solely to chemical transformation, precisely as we see it in chemical operation produced by a primary upon a secondary battery. Our actual knowledge of electricity, I think, makes this theory tenable.

Whatever may be the scientific theory, you see that the practical applications of the galvanic current are varied and numerous. I have particularly dwelt on this last application, the effects of which have a very decided similarity to voluntary muscular movement, but the galvanic current is not limited to usefulness within the sphere of an isolated organ, a single group of muscles, or an entire member suffering from atrophy or paralysis. Many times it has been employed as a remedy for affections which pervade the entire system, and not unfrequently as gratifying results have been thus obtained as with static electricity. In thus applying this harmless excitant to nervous centers, we may produce changed conditions in disease of the centers of motion, of sensation, or of nutrition. These results are so marked as often to induce a class of electricians to abandon all other applications of electricity, and confine themselves to this one form alone. I feel that this is wrong—in electrical not more than other sciences—to be exclusive is to be unsafe.

I will close with a few words relative to an application which is as yet but little known, yet of great importance from the standpoint of medico-legal expert work.

There are sometimes cases of supposed poisoning, where chemistry is incapable of showing traces of the poison. Recourse is then had to physiological experiment. A portion of the body is macerated, and a few drops of this maceration is injected under the skin of an animal, and the creature's symptoms are carefully watched and noted. But this is by no means satisfactory, and it is never positive that the animal may not show symptoms which are due to the natural decomposition of the human remains themselves.

It has been sought to use electricity as a precise method of discovering poison, and to an extent the attempts have been successful, sufficiently so to warrant farther essays in this direction. Frogs and guinea pigs, and even larger animals, were poisoned with vegetable alkaloids, and the muscles and nerves of the subjects excited by electricity. It was shown that for certain poisons the curve of contraction provoked by this treatment presented peculiar and characteristic forms.

Still, there was much uncertainty in this method of investigation. Results were unreliable, unless there was perfect continued uniformity in the excitation in all the experiments. It was imperative that experiments made to day by one party, if repeated to-morrow by another experimenter, should be carried on under the same exact conditions to insure reliable data. Up to the present time this has been impossible of accomplishment. Neither the galvanic battery nor the induction coil can be made to subserve this purpose.

Condensers furnish a simple means of obtaining excitations of constant and measurable value. These are as accurately measured and graduated as the scales in the chemist's laboratory.

Knowing, on the one hand, the capacity of the condenser, and, on the other, the E.M.F. of the battery, it is easy to calculate the energy of the discharge.

With a standard thus based on known quantities - constants—we possess to-day the means of not only recognizing the nature of these poisons, but also of determining exactly what portion of the symptoms are to be attributed to those other poisons arising from animal decomposition.

Finally, while discharges from condensers should be substituted for all other methods of excitation in medico-legal researches and in physiological experiment, these are no less valuable in therapeutics. Besides furnishing known values for use in the treatment of maladies to which electricity is applicable, the instruments permit us to watch the effects of electrosation, day by day. We have tables of averages which indicate to us when the patient is first subjected to their influence, the excitable condition of his nerves and muscles. We know, as the physician who prescribes a medical dose, how much is best for the patient, and we have the means of regularly gauging these applications—increasing or decreasing the prescribed quantity—with exact certainty as he.

I trust you will no longer consider our instruments as simply scientific toys. From a humanitarian standpoint their value will bear favorable comparison with the largest industrial machines; for, while these are sometimes chargeable with death, our apparatus alleviates grievous pain, cures many infirmities, and often aids in saving the lives of the patients entrusted to our care.

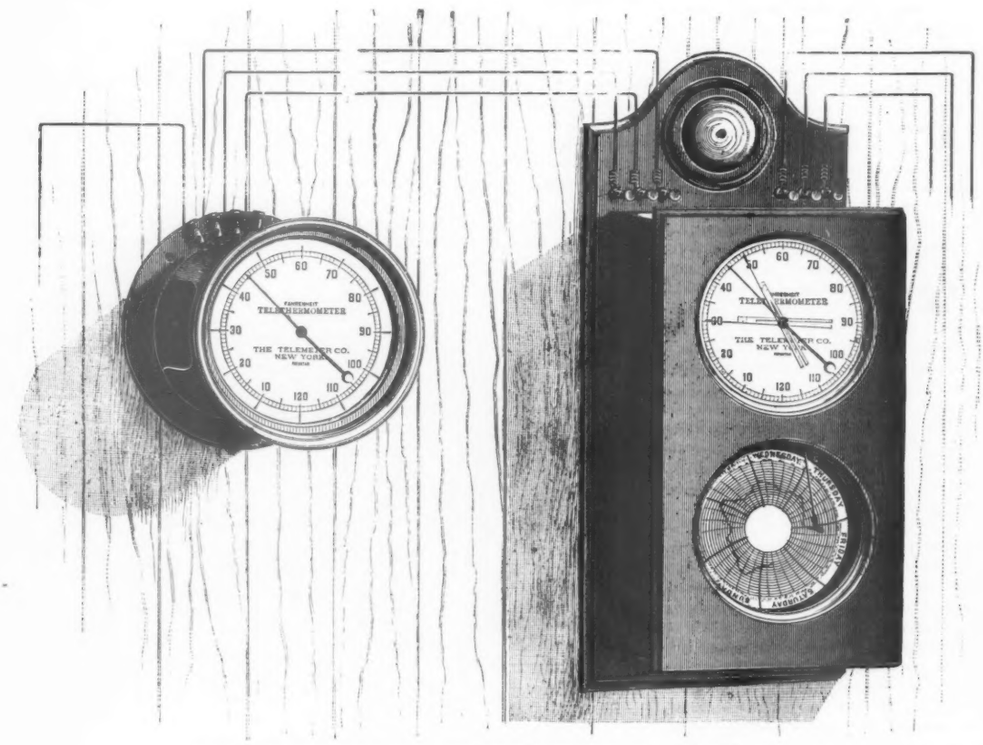

FIG. 1.—TELETHERMOMETER OF THE TELEMETER COMPANY OF NEW YORK.

T. Z. R. Insulated Wire.

The introduction of the newer branches of electrical science, lighting and transmission of power has necessitated improvements in much of the material used. The high-speed engine, automatic oilers, speed recorders, damper regulators have all been improved by the severe requirements of electric plants. Many attempts have been made to provide a covering which shall at once be a non-conductor of electricity, waterproof, capable of resisting abrasion and heat. The T. Z. R. wires combine these qualities to a remarkable degree. A wire carrying currents of high tension is not fire-proof unless waterproof as well. If water pentrates the insulation of a wire, as may be the case after a slight shower, contact with inflammable materials which are damp will offer paths for the current which will cause charring and finally a fire. Contact with the damp clothes of a fireman would be likely to give him a severe shock if nothing worse. Substances which are themselves inflammable but are water-proof so long as they do not deteriorate, are essentially fire-proof; but if the covering cracks, water can then reach the wires and convey the current to the ground. As generally understood, fire-proof wire will not burn when a lighted match is put to it. The covering of the Campbell wire, it is claimed, is so inflammable that it will not burn unless put into a furnace.

The methods and compounds employed in the manufacture of this wire were discovered while experiments were being made to obtain anti induction wire for telephonic purposes. The substance finally discovered is a material new to art. Its manufacture requires new styles of retorts and metallic air-tight chambers. The first of this new wire insulated by hand was run two years ago between the Fitchburgh depot to the Chandler building, a distance of 1¼ miles. Not once during this time has the line failed to work, and the freedom from induction is said to be perfect, and nothing has been spent for repairs. In places where there is a liability to dampness or rough usage this wire is reported to be always successful. The heavier insulation has been in use for six months in the New York aqueduct. The original shipment of this wire is in use at the present day. No difficulty in the way of "grounds" results from running this wire through trees, and as this often means a "short cut," the number of feet required is consequently small.

—— A new feat in the way of electric lighting is the application of cell storage to pianos. The case of the instrument conceals the materials for an illumination lasting over ten hours.

*** Chief Justice Niblack, of the Indiana Supreme Court, has given his decision in the last of the telephone cases. In this the court holds, at length, that the telephone company is a common carrier, and, as such, is subject to all the regulations which the law imposes upon common carriers. It cannot, therefore, refuse service to any person who demands it and fulfills the legal requirements.

(1) Abstract of a paper read by Dr. M. Boudet, of Paris, before the International Society of Electricians.

The New Apparatus of the Telemeter Company, of New York.

The Telemeter Company, of this city, was incorporated in the month of January of this year, and the following official staff elected: President, Erastus Wiman; Vice-President, Francis R. Upton; Secretary and Treasurer, Samuel Allin; General Manager, Wm. F. Brewster; Superintendent, Charles L. Clarke.

The company, which combines financial and practical strength, is organized to develop in all its various effective branches the telemeter system, by means of which the pressure of a steam gauge, or barometer, the height of water in reservoirs, ponds, rivers, tanks, etc, or the height of a gasometer, can be transmitted electrically from the primary instrument to the receiver, which may be located at any distance from the transmitting instrument. This company's offices are at 28 Vesey street. The receiver not only constantly indicates each change in the primary instrument, but also keeps a record in red ink of every change which has been registered in the distant transmitter. An alarm bell is attached to the receiver which rings whenever the index hand moves above or below the maximum or minimum point at which the alarm hands have been set. The company states that this electrical method is entirely new, and that the telemeter system has neither competitors nor imitators. The REVIEW illustrates several of the different instruments of this company. Fig. 1 shows the telethermometer, used for indicating and recording temperature at any distance. To Mr. Robert Hewitt, Jr., is given the credit of having made the first advance with this. Being interested in a refrigerating system, he recognized the necessity of some means of ascertaining at any time the temperature inside of the refrigerator without having to go inside and personally inspect the thermometer. The telethermometer consists of two instruments—the transmitter and the receiver. The transmitter contains a finely adjusted thermometer, with a round dial, upon which an index hand accurately registers the temperature where the transmitter is located. The transmitter has an electrical device for transmitting to the receiver an indication of each change in the temperature. The two instruments may be miles apart, and yet whatever the temperature is at the point where the transmitter is located will be accurately indicated by the index hand on the dial of the receiver. The receiver may be with or without a recording dial. If the recording dial is used, each change in the temperature will be recorded in red ink, and a continuous record of it kept, showing what the temperature has been for each week in the year. The receiver may, or may not, have an alarm bell which rings whenever the temperature rises above, or falls below the maximum or minimum point at which the alarm hands have been set. If a careless employe should allow the temperature to fall below or rise above the predetermined limits (ordered by the management), the alarm hands would continue to indicate the number of degrees the temperature had exceeded the limits prescribed. The practical uses for the telethermometer are many and varied. By locating the receivers and recorders in the office, the management has at all times a complete knowledge and control of the temperatures throughout an entire establishment; and also, if necessary, of hot-houses or refrigerators which may be miles away.

In Fig. 2 is shown the smaller telehydrobarometer for indicating or recording the height of water, oil, etc., at a distance.

Sliced Electricity.

A German explorer, one Dr. Kummel, has discovered, it appears, an electric tree the *Elæssia Electrica*, in New Guinea. He proposes to chop it into slices and set up a central station for lighting by solid generators. The following description is given of the find:

"I stopped under a large tree which seemed particularly to attract the attention of Kummel, who had been finding all kinds of novelties the whole morning, to take exact bearings of a high peak, which was visible through an opening in front of us. To my surprise, the compass seemed utterly drunk. While Kummel and I were discussing this phenomenon one of the men struck with a machette one of a number of peculiar buttresses, which ran up the outside of the tree, splitting off a large slice and severing a curious-looking black core, which formed the center. Kummel pieced his hands on the two ends of the core to look at it more closely (rational action), and instantly gave a yell and rolled head over heels, getting up without his spectacles, and stammering that he had had a severe electric shock (say, 150 volts!)"

The expedition did not possess a galvanometer, but an apology for one was made with a helix of copper wire and the compass, the result going to show that a strong current was passing through every portion of the tree. A forest of these trees was seen, the locality being nearly bare of other vegetation. The black core, we are informed, is composed of pure amorphous carbon. The story of Dr. Kummel strongly suggests a strong favorite German beverage of the same name. Very likely the combination of these two "Kummels" may have resulted in the production of the above fruit of the pen.

—— Some time since the Springfield (Mo.) City Council contracted with the Springfield Electric Light Company for thirty electric lights for three years, at a little over $4,000 a year. Last week the gas light company served notice on the electric light company that they would apply to the circuit judge next Saturday for an order restraining them from putting up the lights. The gas company claims that they have the exclusive right to light the city, and some litigation is looked for before the dispute is settled.

Incandescent Lamps.

Editors Electrical Review:

A solution of the question of how to run incandescent lamps with currents of an E.M.F. of a few volts, was to place a large number of lamps in multiple so that the resistance being reduced a suitable amount of current might flow through the lamps. This, however, will not be the case, for not enough current will pass through any one lamp to raise it to incandescense. Two methods of solving the problem present themselves: using lamps of extremely low resistance or mechanism to convert the current of low pressure into one of higher pressure. The objection to the first method is the cost for large conductors, required if the lamps be run any distance from the dynamo, and the mechanical difficulties, as well as the cost of large platinum wires to connect the carbon filament with the wire outside the lamp. The second method, that of using a converter, is expensive, owing to the first cost and loss of energy in practical operation. Such a converter might be a motor dynamo combined, the motor being suitable for the low tension-current or an induction-converter, whereby making and breaking the primary circuit currents of any desired E.M.F. (according to length of wire in secondary coil) could be obtained. It would seem that the use of low resistance lamps would be preferable to any outside mechanism. In a circuit of high E.M.F. by placing lamps in series sufficient resistance can be introduced in the line. The difficulties encountered are due chiefly to the high potential of the currents used and liability of the filament of the lamps breaking.

F. M. G.

—— The Barrett chloride of silver testing battery, which is handled by E. S. Greeley & Co., of this city, is one of the best batteries in the market, and is rapidly gaining in popularity wherever tried.

—— It has been discovered at the Patent Office that there is not on file a single model of an original telephone. The patent which was issued to Prof. Bell in March, 1876, and which is about to be contested by the Government, was granted without a model being filed. The present officers of the Patent Office do not know how this omission occurred. Since Prof. Bell received his patent there have been numerous improvements to the telephone, and the models of these occupy a good-sized shelf in the model room. They have nothing to do, however, with the original patent to Bell. The exhibits in the suit will probably be confined to the unpatented telephones which, it is alleged, were invented prior to Prof. Bell's application for a patent. These will not occupy a very large space. The Government has not yet made a demand upon the Patent Office for any papers in connection with the suit.

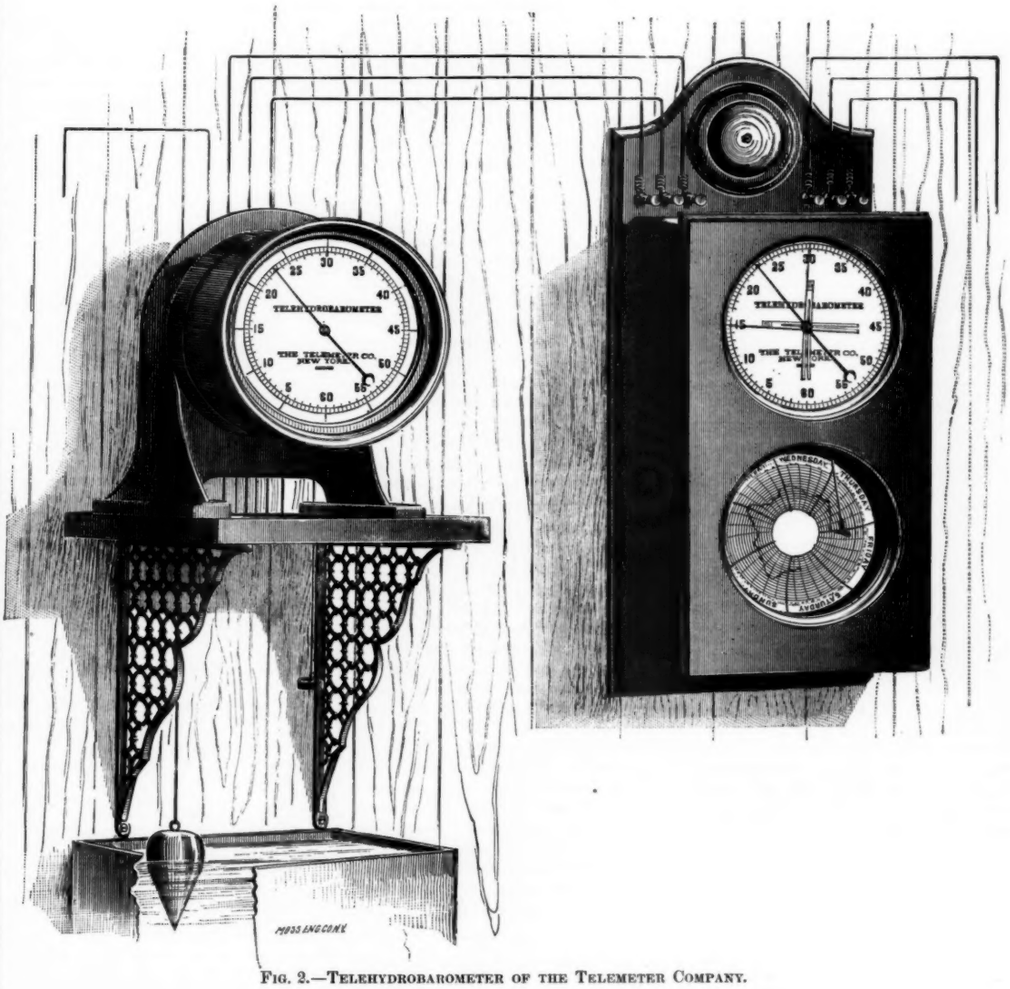

FIG. 2.—TELEHYDROBAROMETER OF THE TELEMETER COMPANY.

—— There are eleven Atlantic ocean cables, seven of which are "duplexed," or capable of receiving and sending at the same time over one wire. The Anglo American Telegraph Company has four cables, three of them between Heart's Content, N. F., and Valencia, Ireland, and one between Duxbury, Mass., and Brest, France. The Direct United States Cable Company has one between Rye Beach, N. H., and Ballinskilling, Ireland. The cable of La Compagnie du Telegraphe de Paris connects North Eastham, Mass., and Brest, France. The American Telegraph and Cable Company's two cables connect Canso, N. S., and Penzance, England. The Commercial Company has two cables, one between Rockport, Mass., and Waterville Island. There is also a cable between Pernambuco, Brazil, and Lisbon, Portugal.

—— Trying to do business without advertising is like winking at a pretty girl through a pair of green goggles. You may know what you are doing, but nobody else does.

Electrical Review.

Published at 23 Park Row.
P. O BOX 3329.

GEO. WORTHINGTON, - - - Editor
CHARLES W. PRICE, Associate "
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United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.

Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, APRIL 3, 1886

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There are some very plain and concise statements of facts as shown by the Patent Office records given to the electrical public on page 13 of this issue, in the case of the owners of the Sawyer-Man system *vs.* the Edison Company.

The Boston District Messenger Service has been reorganized, and Mr. Wm. F. Chester, formerly president and general manager of the Washington Company, has accepted a similar position with the Boston Company. Mr. Chester is thoroughly familiar with the business, and his energetic and effective methods of conducting the service will bring new life to the company in Boston, satisfactory alike to the patrons and stockholders.

In speaking of the accomplishment by means of induction, Mr. A. S. Hibbard, of Milwaukee, says that a house with a metal roof, located within a short distance of the railway track where the system is used, can be converted into a station without a wire connection to the telegraph line. A telephone instrument in the house can be connected with the roof and the ground and a circuit is thus secured. By stepping to the telephone, a Morse operator can read and reduce to paper the message as easily as he could take it from the little brass ticker on the desk. Where there is a large number of wires stretched on the same poles, the sound would be so weak that it could not be distinctly heard, as it would be equally divided on each wire within the limit of the sound of the wire upon which the message is sent.

The annual report of the American Bell Telephone Company appears in this issue of the REVIEW. It is the most comprehensive report ever made by the company, and is a complete and valuable review of the telephone history of this country for the past year.

The telephone fraternity will greatly regret to hear of the death of Charley Ross, Assistant Superintendent of the Central Union Telephone Company, which occurred at Columbus, Ohio, March 25th, of neuralgia of the stomach, after a week's illness. He was widely known and a popular and successful telephone manager. More extended mention of Mr. Ross appears on our eighth page.

Among none of our exchanges, outside the purely scientific and technical, are we so much interested and entertained as by *Geyer's Stationer*, the leading and representative journal of the stationery trades. It is newsy and bright, instructive and amusing, and one may devote a whole morning to examining exchanges and yet not discover so much that is readable and suggestive as is contained in its columns.

The sale of the Southern Telegraph Company, which was to have occurred last Saturday, at Richmond, Va., by the commissioners, was indefinitely postponed, an order to that effect having been entered in the United States Court at Norfolk upon the petition of J. B. Pace, of this city, one of the largest bondholders of the Southern Company. Mr. D. H. Bates, President of the Baltimore and Ohio Telegraph Company; Mr. E. S. Stokes, President of the United Lines Telegraph Company; Mr. Robert G. Ingersoll, and representatives of the Western Union and Mutual Union telegraph companies, were present, and it is very probable that there would have been some lively bidding by these prominent telegraphers had the sale been allowed. The property of the Southern Company would be a valuable addition to any telegraph system.

The telephone lines between this city and Philadelphia are not yet ready for public use, but are so far completed that trial conversations can be held. Through the courtesy of General Manager E. J. Hall, the REVIEW office was put in communication with the telephone company's office in Philadelphia, on Tuesday last, and an unusually satisfactory conversation was held, every word uttered in Philadelphia being heard clearly and distinctly in this office, with no perceptible induction or "noises" interfering. The gentlemen composing the staff of the American Telephone and Telegraph Company are certainly deserving of great praise for bringing this long distance telephoning to its present state, and in doing this they have had difficulties to overcome that none but those actively engaged in this new and highly commendable enterprise fully appreciate.

We publish the complete text of the bill of complaint filed in the U. S. Court at Columbus, Ohio, by the attorneys representing the Government in its suit to annul the Bell telephone patents. The bill comprises little that is new, but covers concisely much that is old, and which has been passed upon by a number of distinguished judges, including Gray, Blatchford, Lowell, Wallace and McKenna, who have in every case decided in favor of Bell. The New York *Sun*, in speaking of these gentlemen, says: "They form a very notable body of men, and they have dispensed justice in the name of the United States in this region for years. For years also there have been inventors and speculators who have tried to show to them, by every method possible to be devised, that the law indicated that the telephone patent belonged to some other person than the patentee, and these judges have invariably and incessantly decided that the law was with Bell." Our readers will find the bill worthy of perusal, as it includes in one collection all complaints that have ever been made against the present successful holders of the Bell patents.

Annual Report of the American Bell Telephone Company.

A VERY COMPLETE AND INTERESTING REVIEW OF THE TELEPHONE BUSINESS.

Sixth Annual Report of the Directors of the American Bell Telephone Company for Year Ending December 31, 1885. Read at the Annual Meeting in Boston, March 30, 1886.

OFFICE OF THE AMERICAN BELL TELEPHONE COMPANY, BOSTON, March 30, 1886.

To the Stockholders:

The year ending December 31, 1885, has not been marked by the increase of business of previous years, but, although there has been a loss of subscribers in exchanges at certain points, on the whole the licensed companies have more than held their own, the total number of subscribers showing an increase of 2,969, and in telephones in use of 4,466 during the year.

The comparative statistics which follow are substantially accurate; but, as usual, we are prevented from giving figures with the precision which would be possible if the entire telephone system were managed by us directly:

EXCHANGES.

	1883.	1884.	1885.	1886.	Decrease from 1885.	Increase over 1885.
Exchanges	725	906	784	732	52	.....
Branch offices	345	419	491	632	40	141
Miles of wires on poles	.....	.....	86,491	100,638	.....	12,147
do. on buildings	.....	.....	11,896	10,049	1,847	.....
do. underground	.....	.....	1,225	3,428	.....	2,203
do. submarine	.....	.....	.....	264	.....	264
Total miles of wire	68,071	88,896	101,592	114,371	.....	12,779
Total circuits	74,884	97,422	107,208	110,967	.....	3,759
Total subscribers	97,728	126,025	134,601	137,570	.....	2,969
Total employés	3,710	4,762	5,102	5,284	.....	182

UNDERGROUND WIRES.

	Miles of Wire Underground, 1885.	Miles of Wire Underground, 1886.	Increase over 1885.
Washington	770	992	222
Chicago	...	760	760
New York	....	627	627
Pittsburgh	223	614	391
Boston	232	289	57
Brooklyn	....	134	134
Baltimore	....	11	11
Milwaukee	....	1	1
	1,225	3,428	2,203

EXTRA-TERRITORIAL LINES.

	Jan. 1, 1883.	Jan. 1, 1884.	Jan. 1, 1885.	Jan. 1, 1886.	Increase During 1885.
Number of lines	247	598	836	931	105
Miles of pole lines	6,154	20,502	25,766	31,395	5,629
Miles of wire	13,653	29,359	35,631	42,461	6,830

INSTRUMENTS.

	Dec. 20, 1882.	Dec. 20, 1883.	Dec. 20, 1884	Dec. 20, 1885.	Increase Year.
In hands of licensees, under rental	237,728	298,580	325,574	330,040	4,466

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States is 746,517
Or a total per year of 272,478,705
The number of calls per subscriber varies in different exchanges from 2 to 10 daily, the average throughout the United States being ..... 5 $\frac{48}{100}$
as compared with ..... 5 $\frac{18}{100}$
the number reported last year,
an increase of about 5 per cent.
The average cost to the subscriber varies according to the size of the exchange and the character of the service, from 2 to 7 cents per connection.

EXTRA-TERRITORIAL BUSINESS.

The average daily number of extra-territorial connections is 6,663
or a total number per year of 2,431,995
The extra-territorial earnings, as reported, amounted to $5 8,740 43
of which this Company's share is $72,677 28
an increase over 1884 of $5,411 63

Last year's statement included the connections between exchanges of the New York and New Jersey, and the Pacific Bell and Sunset Companies, on the receipts from which we receive no percentage. These do not appear this year, which will account for the apparent decrease in the number of connections.

The removal of open wires from house tops to overhead cables and to underground conduits has continued, the progress in the latter respect being especially encouraging. The system must always be a mixed one, as the final distribution of wires to the customers, and the method of reaching places where underground work would be too costly, must still be overhead; but we think that, within a few years, in all large cities the open wires will be placed in cables above or under ground to such an extent, at least so far as telephone companies are concerned, that the overhead wire nuisance will no longer be serious.

In New York an amendment to the law which ordered all wires in New York city and Brooklyn under ground before last November, was adopted, establishing a Commission for each of these cities with power to supervise the execution of the law, and to arrange for placing the wires under ground to such an extent as might be found practicable.

In Brooklyn the Commission has permitted the wire companies to begin their work, and one hundred and thirty four miles of underground wire have been placed there by the Telephone Company. In New York the Metropolitan Company in August, 1885, filed with the Commission the necessary plans and statements for an underground system, and applied for permission to prosecute the work, but so far without success, and this work in that city is at present at a standstill.

The treasurer's statement to Dec. 31, 1885, shows gross earnings for the year, from all sources, of		$2,765,884 93
Expenses		972,688 45
Net earnings		$1,793,196 48
Miscellaneous credits		16,800 00
Total		$1,809,196 48
Regular dividends paid	$1,170,192 00	
Extra dividends paid	392,044 00	
Total	$1,562,236 00	
Reserve written off for depreciation of instruments	100,752 90	
		$1,682,988 90
Balance to surplus account		$147,007 58
Total surplus to date		$1,204,120 01

We have received during the year in stock of licensed companies, $516,316.67, of which $207,200 was for licenses, and the rest for cash, and have sold $29,631. We have received during the year in dividends from licensed companies, $597,469.99, an increase of about $122,000 over the previous year.

With longer experience the telephone companies have learned that the cost of maintaining and reconstructing their plant has been generally underestimated, and many of them have in consequence been forced to recognize that the profits upon telephone business are less than they had expected and believed. For this reason they have appealed to us to make certain concessions in their contract relations, and we have given this subject careful consideration.

We think that our licensed companies should be led to feel that it is for our interest as much as their own that they should be successful. The agreements, speaking broadly, between our licensees and ourselves, are that they shall furnish capital for establishing and developing the business, and that we shall supply the patents, which for a time are expected to give exclusive rights, and returns large enough to invite capital to an industry involving unusual risks.

We have met our licensees; *first*, by agreeing when desired, that our share of net earnings jointly with theirs, may be used for construction purposes, so that we in these cases are sharing the cost of developing the business; *second*, we have made a reduction in the royalties on telephones used in small places where the rates are low. This reduction involves a loss of royalty amounting to

about $200,000 per annum on our present business, ofset, as we believe, by keeping more telephones in use than would be out under the old rates, and it gives relief where it is most needed.

In the case of the New England Company, we have made substantial concessions to the licensees, and have agreed to amend their contract so as to provide for future construction, and at the same time to enable dividends to be paid from the net earnings, which have necessarily been used for some time past for the purposes of construction; and we are carefully maturing plans by which those companies which are not receiving a fair return upon the cash actually invested in the business, may no longer be deprived of an income upon their property.

During the year a pole line has been built between New York and Philadelphia, with a capacity of seventy wires, and twenty-four copper wires placed upon them. various sizes being taken for the purposes of experiment. Some difficulty has been found in securing rights of way for this line. Sufficient facilities are not yet secured in Philadelphia for reaching customers there, but it is expected that this will soon be accomplished so that the question of commercial demand betweeni two large cities a hundred miles apart wil presently have a fair test. The Metropolitan Company of New York, pays for and owns over one half of this line, and will divide the expenses and receipts with us. The line is practically completed, and, with twenty-five wires, will cost about $215,000.

In our report last year it was mentioned that additional capital would be needed for this business; and that we had applied to the Massachusetts legislature to authorize an increase in our stock. As this was refused, and the volume of the business, if successful, will need capital far beyond the amount of our unsold stock, we have been oblige to make other provisions for developing this important branch, and have organized a company under the laws of New York for this purpose, called the American Telephone and Telegraph Company. Mr. Vail has been made President of the company, and has general supervision of its work. Mr. E. J. Hall, Jr., is the general manager, with immediate charge. As soon as sufficient encouragement is received to continue building these long lines. the above company is prepared to build between Boston and New York, and other important points.

The Canada Company has had a year of prosperity in spite of the adverse action of the Government in annulling the Bell patents. Their subscribers have increased from 7,418 to 9,614, in fact more than in any previous year. The company gives good service, is not discouraged by threatening legislation from extending facilities as fast as needed, and has increased its net earnings from $119,000 in 1884, to $150,000, in 1885.

To meet its necessary construction, this company increased its capital stock in 1885, $250,000, of which $200,000 has been issued, and which was sold at par. Of this increase we took our *pro rata* share, namely, $117,500. Its stock of $1,200,000 is worth par, and its Montreal directors, who are also considerable stockholders, feel much encouraged about the future of the company In December, 1885, a decision was rendered by the Department of Agriculture, to the effect that the Edison patents owned by the Canadian Company had not been forfeited under the provisions of their Patent Act.

During the year a number of our cases have been argued and decisions reached or injunctions granted A short statement of the most important is as follows:—

The case against the Molecular Telephone Company, which has been pending since July, 1883, was argued before Judge Wallace on the 30th of March, and on the 24th of June a final decree was given for the complainants, and an injunction issued.

The Rogers Telegraph and Telephone Company, a licensee of the Pan Electric Company in Pennsylvania suffered default, and an injunction issued on the 26th of June; and in the same State a preliminary injunction was granted. after full hearing before Judges McKennan and Atcheson, on the 8th of July, in the case of the Western Pennsylvania Telephone and Telegraph Company, a licensee of the National Improved Company, and final decree was made and injunction issued in December following.

On July 16, a bill was filed in Baltimore against the Pan Electric Company and its licencees in that city and in Washington, and on Sept. 15 the Court refused to grant delay, and issued a restraining order until the case could be heard.

The case against the Peoples' Telephone and Telegraph Company, using the Hopkins instruments, was finally argued before Judge Wallace in December, and an injunction was granted the same day. At the same time he heard arguments in the parent Overland case, and at once granted the injunction.

Depending on the last case were suits against various of the Overland sub-companies, and injunctions issued against all of these. This includes the following companies:—

Overland Company, of New Jersey; Penn. Overland Company; Baxter Overland Company, of Philadelphia; Maryland Overland Company; Indiana Overland Company; Baxter Overland Company, of Central New York, and Michigan Overland Company.

In the suit against the Overland Telephone Comyany of Lexington Ky., begun Aug. 31, 1885, arguments were heard on Oct. 6, and a preliminary injunction was granted Oct. 8.

The Drawbaugh case was re-opened in October by consent, to allow the defendants to put in what they claimed to be newly discovered evidence, and arguments on this were heard by Judge Wallace, at Syracuse, in December, but the Judge decided that their was nothing in the new matter to alter the views already expressed by him, and he reaffirmed his former decree.

Other injunctions granted during the year were against the McDonough Company on February 14, 1885; New Jersey Telephone Company, using the McDonough claims, on July 10; and the Citizens' Telephone and Telegraph Company (Cleveland, Ohio), on August 18

The Dolbear, Drawbaugh, Molecular, Overland, and West Pennsylvania cases are either in, or on their way to, the Superior Court, and the Dolbear case is expeted to be reached at the October term.

Regarding the procee lings of the Pan Electric Company and the proposed Government suit, the stockholders will naturally feel much interest and the facts will be stated somewhat in detail:

The Pan Electric Telephone Company was organized in 1883. with a capital of $5,000,000, the ostensible basis of value for which was a group of patents, some of which related to telephones, of one Rogers. Its headquarters are in Memphis, Tennessee, which is also the home of Senator Harris, and others of its promoters.

These patents are perhaps the most palpable infringements upon the Bell patents that any one has yet attempted to rely upon; there is not even the pretence of any invention prior to Bell, and the inventions are of no importance whatever. The company had apparently so little to offer, that it was for a time difficult to see what they expected to accomplish, either in the establishment of a telephone business, or in starting a legal contest.

The principal stockholders were leading politicians in the Southern States, and their operations, so far as the telephone business goes, have been mostly confined to that part of the country.

General Joseph E. Johnston, of Virginia, was made president of the company, Senator A. H. Garland, of Arkansas, its attorney, and Senator Harris, of Tennessee, General Johnston, Senator Garland, Casey Young, J. D. C. Atkins, of Tennessee, J. H Rogers, formerly of Tennessee, now of Washington, D. C., and Robert F. Looney, of Tennessee, its directors.

These gentlemen received large blocks of the capital stock, paying nominal sums in money for the same. Sub-companies were formed, from whom bonuses in cash were taken for the right to practice the Rogers inventions in different places, and additional blocks of the stock of these sub-companies appear to have come to the promoters. On Jan. 4, 1884, Mr. Garland was asked for an opinion on the Rogers patents. One D. E. Myers, who said that his attention had been drawn to the stock of the Pan Electric Company, wrote as if for information upon a matter of investment, but it appears that Myers was himself in the service of the Pan Electric Company, and was therefore not interested in buying its stock, but in selling it.

Mr. Garland replied upon the following day, giving what from its tone purports to be a professional opinion, to the effect that he had carefully examined the Rogers patents, and that he was clear that they in no way infringed the Bell patent. Nothing contained in his letter indicated that he was interested deeply, as a stockholder, in the market value of the Pan Electric stock. Upon this opinion largely, it appears, the bonuses were obtained from sub-companies and efforts were made to sell Pan Electric stock.

Yet it is clear that the right to practice the Rogers inventions could have no substantial value under any circumstances. If the patents now controling the telephone business could be declared void, the Pan Electric would only share the telephone field with all comers, and the rights for which the bonuses and stock were taken are wholly of imaginary value, while Mr. Garland's opinion about the Rogers patents was not shared even by his associates, since it was renounced by them at the hearing before Secretary Lamar, when they squarely stated that if Bell's patents were valid, the Rogers patents infringed them, and they did not propose to contest that point.

The first way in which the influential names were to be used was, therefore, in getting money for supposed rights which had no value. The second was perhaps equally ingenious, but so far not as successful. It was a plan to get the suits of the Bell Company against the Pan Electric Company and associates stopped. The programme for accomplishing this was as follows: In 1884 an attempt was made to get a statute through Congress, authorizing the Government to bring suit to have patents vacated under certain circumstances. This measure was got through the House almost unnoticed, but it did not pass the Senate Committee on Patents.

This move failed, but after Mr. Garland became Attorney-General, and the other Pan Electric leaders received important positions under the Government, it was decided without the aid of any statute to ask Attorney-General Garland to order a suit brought to annul Bell's Patents, on the ground that he obtained them by fraud, and that he was not the first inventor.

Mr. Garland declined to act, but left Washington for Arkansas, and his next in office, Mr. Goode of Virginia, within a day or two of his departure, received a similar request from an associate company of the Pan Electric, called the National Improved Telephone Company of New Orleans, and upon one day's examination decided that there was reason and authority for consenting, and he ordered the suit brought, not in Massachusetts, where our company exists, but in Memphis Tennessee. He further placed in charge of this suit, with authority to proceed in the name of the Government, the very man who is the most active manager in the Pan Electric enterprise, namely, Casey Young, its secretary and treasurer, and Geo. B. Gantt, also a stockholder, and Luke E. Wright, of Memphis, and J. R. Beckwith, of New Orleans. For some reason these men were so confident that the suit would be ordered, that they had a bill all ready (printed beforehand in New Orleans), which was immediately filed in Memphis.

As soon as Mr. Goode ordered this government suit, counsel for the Pan Electric appeared in Baltimore before Judge Bond, who was about to hear our application for injunction against that company, and asked for a postponement of proceedings, for the reason that the government suit was a valid objection to a preliminary injunction, thus exposing the motive of the whole movement. This request was not granted, a restraining order against the Pan Electric Company was issued, and the Court will hear the case in due course.

The President, finding that Mr. Goode's action had been taken without reference for information to the Department of the Interior, suggested to the Department of Justice, that it would be better to conform to usage in such matters; and the suit was withdrawn. A new request was then preferred and sent to the Department of the Interior for information. The Secretary of the Interior, Mr. Lamar, of Mississippi, gave a hearing, lasting a week, on the question of the Government suit, at which Messrs. Dickerson, Smith, and Storrow, appeared for us. Without considering the merits of the questions involved, he advised that the Government had a right to bring such a suit, and also that it should do so, apparently because there was an allegation of fraud involving officers of one of the departments, which, for some reason not explained, he thought could alone effectually be investigated in a suit by the Government itself; but he advised that the Government should conduct its own case and at its own expense.

On the 1st of February our suit for injunction against the National Improved Company in New Orleans, the associate of the Pan Electric Company, was reached. Once more the counsel for our opponents appeared, with the request that the case be postponed because the Secretary of the Interior had advised the Government to bring suit against us, and that other cases ought not to be heard until that was decided.

It is easy to understand the injury to the Bell interests that would follow if the United States courts should refuse us all protection against infringement until the government could try over again and determine all the questions relating to the priority of the telephone invention, which it has taken us eight years of arduous litigation to bring to their present condition of readiness for the Supreme Court.

The Court at New Orleans refused to stay proceedings, the arguments have just been heard and we hope for an early injunction in this case.

Here, then, the whole programme lies exposed: a plan to sell rights that had no value on the strength of prominent names—a plan to wreck our property by stopping our suits, pending years of wholly unnecessary litigation—a plan to deceive the public into the belief that the defeat of the Bell patents would confer value upon Pan Electric stock;—a plan to inveigle Mr. Cleveland's administration into support of this scheme.

If such a plan can succeed, what interest in this wide country is safe from an infamous attack? If any doubts have existed as to the expediency of statute permitting such action on the part of the Government, the proceedings of the Pan Electric associates, and the fact that they could secure the aid of such men as Mr. Garland, Mr. Harris, and General Johnston, ought to be put an end to them. If there is any reason to believe that such power is already within the reach of the Government, without a statute, can any one doubt that it should be removed by immediate prohibition from Congress?

If the Government, upon a simple allegation of fraud in the obtaining of patents or other Government grants, made by interested parties, can be called upon to bring suits either at its own expense, or under the management of the interested party, to annul its own agreements, any poor inventor may have his fortune wrecked by powerful competitors; any owner of property based upon Government agreements or land or other grants may find the Government, on whose faith he has expended his money, appearing before its own Courts, in favor of some irresponsible or dishonest claimant.

It has been urged that nothing but the annulling of our patent in suit, by the Government itself, would suffice to enable others to enter the telephone field. There is no weight in this, for with every decision in our favor, we have barely been able to keep the field free from serious infringement, and it is certain that one decision by the United States Court, invalidating our patent, would be enough to flood the country with competing companies.

It seemed inconceivable that, upon this state of facts, the essential parts of which were already public, the Government should lend any countenance to such an enterprise. We felt entire confidence that Mr. Lamar would advise that, at least under such circumstances, the two parties interested should be left to fight their battles before the courts in the usual way, and his decision took us wholly by surprise.

When he made it public, it seemed proper to place the facts in the case before the President; and the president of your company went to Washington, and had an interview with Mr. Cleveland. The latter was told that the present owners of the Bell Patents had bought them in good faith, in the belief, which they still entertained, that they were properly obtained, and were valid; that on the strength of United States patents, and repeated decisions of the United States Courts in their favor, the parent company and its licensees had invested vast sums of money in putting this invention into use throughout the country; that the sum of fifty or sixty millions of dollars were now at stake in the business. That every issue which the Government was asked to raise was already in the records of several cases that had been argued and passed upon by the United States Courts, which were already far on their way to the Supreme Court, on appeal, and that the first of these cases was expected to come up in October. That we had expended eight years of litigation, involving over fifty days of argument by the ablest counsel we could procure, the taking of over five thousand pages of testimony, and the expenditure of half a million of dollars. That our licensees could not but view with alarm the prospect of going once more over this expensive and tedious road, in the face of a suit brought by the Government at the instance of a company which they believed to be wholly speculative and irresponsible.

It was shown that the programme of the Pan Electric Company was to get our suits stopped, and not tried, and to avail of official influence to get this accomplished, and it was explained how thoroughly our property could be destroyed without trial, could the existing suits be suspended while the Government suit was slowly making its way to a decision.

But the Government adheres to the advice of Mr. Lamar, and on the twenty-third day of March filed a bill against this company and our licensees in Ohio, at Columbus, Ohio, before Judge Baxter, who would also have heard the case had it been brought at Memphis. Messrs. Thurman, of Columbus, and Lowery, of New York, with several others, have been selected as counsel, and it is not our belief that the management of the suit is to be left within the control of the Pan Electric Company, or that the government intends to allow any unnecessary delay to be interposed in its prosecution. It is to be noted, however, that it has taken this distinguished group of counsel over two months to decide the questions which Mr. Goode disposed of in a single day.

While there has undoubtedly been a widespread feeling of anxiety among our stockholders and licensees at finding the power of the Government thrown into the scale before its own courts, under the circumstances just described, our counsel and the directors feel no uneasiness as to the result of such a suit, as all the matters involved have been the subject of repeated decisions.

Regarding the question of locality of a government suit, we are advised by counsel that jurisdiction can only be had over us in Massachusetts.

It is said that the Government seeks to find a place where no telephone cases have yet been heard, but if this be true, its attitude is not easy to understand.

If the subject has already been passed upon, it cannot under established usage be again considered by the Circuit Courts, and if it is new, a court which has already made itself

(*Continued on page* 8.)

Telephonic News

*** Morgantown, Lenoir, Blowing Rock and Piedmont Springs, N. C., are all to be connected by telephone.

*** A Lowell special says: Erie Telephone Company declared its usual quarterly dividend to-day of 50 cents per share.

*** The annual meeting of the Mexican Telephone Company is called at the Astor House, in New York, April 14. The books closed March 20.

*** It is claimed that no woman ever answers a call by telephone without smoothing down her hair, working up a smile, and trying to make a good impression on the transmitter.

*** The improved flexible cords made by the Western Electric Company are meeting with great favor. The advantages of the new form of conductor, for either telephone or switchboard cords, are such as to lead to its general adoption.

*** The Western Electric Company has been obliged to increase its facilities for the production of Disque Le Clanche Batteries, owing to the large demand which results from the superior materials and care employed in their manufacture.

*** A new telephone company, known as the "Egan Telegraph and Telephone Company," has been incorporated in Columbus, Ohio. Mr. Chas. E. Egan's patents are to be used. The incorporators are W. Y. Miles, C. D. Firestone, Geo. M. Peters, C. E. Egan, J. H. Butler, and others.

*** The American Telephone and Telegraph Company have located their public telephone exchange for Philadelphia connections at 140 Fulton street this city. The switchboards are being set up, and private offices arranged so that patrons can hold secret conversation with Philadelphia parties.

*** The Turnbull telephone, the experiments with which the REVIEW has described, is not going to have a path of flowers to success. Major William Chase Barney is about to make things interesting for it by endeavoring to show that it is an infringement of the molecular telephone patent, taken out several years ago, and containing for its chief feature the perpendicular pendent carbons resting against a horizontal carbon bar. Major Barney declares that the Turnbull telephone has not a point about it which has not already been covered. He is preparing to publish a warning through the press to intending investors.

*** The statement of the output of telephones by the American Bell company for the month ended March 20, as compared with last year, is as follows:

	1886.	1885.	Inc
Gross output...	2,819	2,027	*208
Instruments returned....	1,232	2,967	1,735
Net output.....	1,587	60	1,527

*Decrease.

Thus far this year the output has been as follows:

Gross output.....	8,822	7,171	1,651
Instruments returned....	4,188	8,008	*3,815
Net output	4,634	†832	5,466

*Decrease. †Net loss.

*** In April of last year the United States Circuit Court granted an order restraining the Clay Commercial Telephone Company, of Philadelphia, from carrying on its business, and after hearing argument reserved its decision in the case. Counsel for the Clay Commercial Company recently filed a petition in that city asking to have the restraining order revoked and annuled and a decision in the suit postponed until such time when the suit to be instituted by the United States against Alexander Graham Bell, involving the validity of the latter's patents, shall be determined. No further action was taken than the filing of the petition.

Charges Made in the Government Telephone Suit.

THE REASONS PRESENTED FOR SEEKING TO ANNUL THE PATENTS ISSUED TO ALEXANDER GRAHAM BELL.

The petition of bill of complaint in the suit brought by the United States Government to annul and vacate the Bell telephone patents was filed in the United States Circuit Court, in Columbus, Ohio, last week, by District Attorney Kumler. Process was issued also directing appearance by the defendants by May 1, and requiring the answer to be filed on or before June 1. The petition with its accompanying exhibits fills a large printed pamphlet. From this it is apparent that the groundwork of the action is the fraud alleged to have been practiced by Alexander Graham Bell in obtaining his patents by the connivance of persons holding official position in the United States Patent Office and by misrepresentations made in his behalf. On the question of the jurisdiction of the court in Ohio, the bill is explicit and shows the grounds for bringing the suit here. It is understood that this will be the first question that will be discussed in connection with the case. The local counsel retained by the Bell people are Messrs. Taylor & Taylor.

In the bill of complaint the United States of America appears as complainant, the respondents being thus described: "The American Bell Telephone Company, a corporation under the laws of Massachusetts; the Central Union Telephone Company, a corporation under the laws of Illinois; the Erie Telephone and Telegraph Company, incorporated under the laws of the State of Massachusetts; the Central District and Printing Telegraph Company, incorporated under the laws of Pennsylvania; the Cleveland Telephone Company, the City and Suburban Telegraph Company, the Miami Telephone Company, the Buckeye Telephone Company—the latter four companies incorporated under the laws of Ohio—and Alexander Graham Bell. The bill is one in equity and is addressed to the Judges of the United States Circuit Court for the Southern District of Ohio, Eastern Division. The counsel appearing for the Government in the matter are Solicitor-General Goode, acting for the Attorney-General; Philip H. Kumler, United States District Attorney, for the Southern District of Ohio, and these special counsel: Messrs. Allen G. Thurman, Grosvenor P. Lowrey, Hunton & Chandler, and Charles S. Whitman. The Solicitor-General acts for the Attorney-General in the matter, it is explained, because of the latter's disability to prosecute.

We publish below the chief features of the bill, showing fully the position taken by the Government's counsel:

The United States is empowered, the bill goes on to say, to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries. The conditions are that the art or thing shall be new and useful and that a patent shall have been duly obtained. It is the duty of an applicant for a patent to make known fully, fairly, and in good faith to the proper Government officers all matters bearing on his invention or discovery and its connection with the history or state of the art to which the invention or discovery belongs. This is for the purpose of enabling these officers to determine properly whether the applicant is really the first inventor and thereby entitled to the grant of a monopoly. The power and authority to issue a patent extends only to the case of inventions actually new and useful, and to the person who is the true original, and first inventor. Whenever a patent is, by accident, inadvertence, mistake, or fraud issued to a person who is not the true inventor or for an invention or part of an invention not both new and useful, the Government may bring the case to a judicial investigation and determination, so that the patent may be upheld, annulled, reformed, or modified "as in law and equity and good conscience it ought to be."

It is in pursuance of this duty that the charge is made that certain letters patent issued to Bell, dated March 7, 1876, and numbered 174,465 were illegally and improperly procured to be issued, and the present suit it brought for the purpose of having justice done to the various parties to the action, as well as to all others in whose interest and for the restoration and protection of whose rights this proceeding is instituted. The Patent Office records bearing on the case are made part of the complaint. In order for Bell to obtain his patent lawfully it was necessary for him, under the provisions of section 4,888 of the Revised Statutes, to file in the Patent Office a written description of his alleged invention and the manner and process of using it in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertained, or with which it is most nearly connected, to make and use the same. In regard to any machine or apparatus connected with it his duty was to explain the principle and the best mode of applying such principle so as to distinguish it from other inventions, and to point out particularly what he claimed as his invention or discovery. Any intentional omission or failure to do this or any attempt by wide generalizations and ambiguous language to discourage further inventions in the same field, or to cover antecedent or future inventions or to deceive or mislead the public, rendered the patent void.

Although up to the time of the issue of the patent to Bell he had never in fact been able to transmit articulate speech by the method or apparatus described by him in his application, he purposely, it is charged, framed his application and claim in ambiguous and general terms so as to cover antecedent and future inventions and to mislead the public and the patent examiners. He did not declare that his invention had anything to do with transmitting articulate speech by means of electricity, but referred to it as an "improvement in telegraphy," and made special reference to a recent application made by him for a patent for a method of "multiple telegraphy," and treated his invention as another method of this. He made no claim for a capacity to transmit speech. This misled the examiners, who failed to make search on the subject of transmitting speech by electricity, and rendered the patent so issued void. Moreover, on January 20, 1876, when Bell filed his application, he did not believe himself to be the inventor of all the so-called improvements in telegraphy described and claimed in the specification. He did know and believe that certain of these improvements had been previously known to and used by others. If it had not been for his untrue statements on these points the patent would not have been issued to Bell.

It was well known at the time that Philip Reis, of Germany, did about 1861 devise, and subsequently improve, an apparatus for transmitting speech by means of the galvanic current. The publication of his work was familiar to the scientific world, and prior to Bell's application a number of persons in this country devised more or less perfect forms of apparatus for transmitting speech by means of electricity.

On February 14, 1876, the day on which Bell filed his application at the Patent Office, and before he did so, Elisha Gray, of Chicago, filed a caveat for an invention expressly declared to be "to transmit the tones of the human voice through a telegraphic circuit and reproduce them at the receiving end of the line, so that actual conversation can be carried on by persons at a long distance apart," the claim being for "the art of transmitting vocal sounds or conversation telegraphically through an electric circuit." By law—Section 4 902, Revised Statutes—Gray was entitled to have his caveat preserved in secrecy in the Patent Office, and to file his description, specification, drawings, and model within three months after notice of any other application, filed within one year, with which such caveat would in any manner interfere. Gray was also entitled to have Bell's application, with its description, model, etc, depo-ited in the confidential archives of the Patent Office until three months had expired, so that if Bell's claim interfered with his own the Patent Office should apprise Gray of the fact. The examining officer notified Gray on February 19, 1876, of Bell's claim, describing the latter's application as one for a "telephonic telegraph," which signified "a far-sounding method of transmitting telegraphic signals, but not a far-speaking instrument for the transmission of human speech," such as Gray claimed in his caveat.

Despite the statutory requirements as to secrecy, the examining officer of the Patent Office communicated to Bell the fact of the filing of Gray's caveat soon after this was done, as well as the general nature of the claim contained in it, and some information of the particular method employed. Bell followed up this knowledge, and induced some of the patent officers to further violate the requirement of secrecy by setting on foot an inquiry for Bell's benefit as to the precise time of the day when Gray's caveat was filed, "and thereupon, without any certain proof, and contrary to law and the custom of the office, it was determined, contrary to the fact, that said caveat was filed after said application, although on the same day." As a result, it was determined that Gray was not entitled to the notice which had already been given, nor to the benefits of Section 4,920 as regards Bell's application. The Patent Office Examiner, who had the matter in charge, without letting Gray know of the question that had been raised as to the time of filing or of its determination, and without giving him any opportunity to prove the time of filing his caveat, announced to him on Feb. 25, 1876, that the notice sent him had been given under a misapprehension and was withdrawn. The complaint then sets forth:

"That the said Bell, having unlawfully obtained certain information as to essential features of the invention of Gray as disclosed by his caveat, proceeded without delay to make substantial amendments of his specification and claims, which amendments were made on the 29th day of February, only four days after said withdrawal of notice was communicated to said Gray; that such amendments related to such parts of said Bell's alleged invention which he and his assigns have since claimed as the cardinal element or feature of his patent—to wit, the transmission of sounds by gradual or undulatory changes in the electrical current, as distinguished from alternate or pulsatory changes; that in the notice of the 19th of February, 1876, the said Examiner had distinctly advised the said Gray that the application of Bell seemed to conflict with his caveat in respect to 'the method of producing the undulations by varying the resistance of the circuit, and the method of transmitting vocal sounds telegraphically by causing these undulating currents;' that this same Examiner, without the knowledge of the said Gray, communicated to Bell the fact that Gray's invention varied the resistance and produced undulations by means of a liquid transmitter; that upon and in consequence of this surreptitious information, and of the unlawful communications respecting the said caveats made to the said Bell, as herein above alleged, the said Bell made the said amendments, more clearly defining the distinction between pulsatory and undulatory currents, and substituting the word 'gradually' for 'alternately' wherever it occurred in one of his claims; and your orator charges that these amendments were substantial, as well in themselves as in their bearing upon the rights then secured by Gray under the statute, and were not verified by oath, and that the said patent was issued thereon and during the pendency of said caveat, and with undue and unusual haste, and without proper consideration of the rights secured by said Gray, or of the interest of the citizens of the United States with respect to the art of telephony sought to be monopolized by said Bell.

"And your orator further shows that the said Bell ingratiated himself into the favor and confidence of the attorney of said Gray, and, in order to induce the said Gray to abandon his caveat, did, as early as March 3, 1876, and before his said patent was issued, falsely and fraudulently cause said attorney to believe that he (Bell) had invented a speaking telephone prior to the said January 20, 1876, and also that such invention was really described therein, and induced said attorney so to represent to said Gray; and that accordingly the said attorney, by letter of March 3, 1876, caused the said Gray to be informed that the said Bell had the older and better claim, and gave it as his 'judgment' that it would not be advisable for the said Gray to press his claim for the invention.

"Your orator shows, on information and belief, that said Gray believed these false

suggestions, and was thereby induced to take, and did take, no action in pressing his said caveat for a patent for many months, and until long after said Bell had secured his said patent upon his said application, and that by these wrongs and frauds aforesaid, and others to be presently stated, said Bell succeeded in securing the aforesaid patent for an invention of great value which he did not discover, and to which, as between him and said Gray, the said Gray was entitled to priority."

The Examiner regarded Bell's application as one for an improvement in multiple telegraphy, as the bill states. His opinion was that Bell's application and Gray's caveat interfered on principles employed in harmonic or multiple telegraphy, but not in the art of transmitting speech. Bell's language and drawing gave no intelligible notice that one portion of his specification related to telephony, which had come in general use as the term for denoting the transmission of speech by means of electricity.

It was on March 10, 1876, three days after the patent was issued to him, that Bell obtained for the first time articulate speech by an electric speaking telephone. This was not achieved with any device or apparatus described in his specification and patent, but was obtained by the liquid transmitter or water telephone described in Gray's caveat and derived by Bell from the latter. Bell's devices, up to the time of filing his application, did not transmit and deliver articulate speech. He did not intend so to operate them, nor was he aware that they would do so. There is not and never was, it is declared, an electric speaking telephone in use made in accordance with Bell's alleged invention, and the instrument used by the American Bell Company was not invented or discovered by Bell, "nor did he invent or discover any essential part or principle of the same." The instruments are declared to be combinations of the inventions of other persons, some made before and some since Bell's alleged discovery.

Another point made is that even if Gray's caveat had not been filed and Bell's patent had been properly issued as for the improvement in telegraphy described in it, it would still be void and ineffective to secure any exclusive claim for the art of transmitting audible speech by the process set forth in the fifth claim of Bell's patent, because all his claims are bad in form and substance and void as a matter of law. The fifth claim is for the method of and apparatus for transmitting vocal and other sounds telegraphically by causing electrical undulations similar in form to the vibrations of the air accompanying the sounds. This is declared to be void because the words "method of" merely describe the function and mode of operation of the machine. The claim for an "apparatus" is void because no mechanical device is specified. The claim of causing undulations in a particular supposed form is a mere matter of speculation and is not the subject of a patent. The transmission of vocal sounds by electricity was notoriously old, and there is no attempt to claim a more perfect transmission electrically. The patent, furthermore, is void because it does not point out and distinctly claim a new and useful art, machine, manufacture, or composition of matter, but attempts to include in a patent and claim the alleged invention of an art and a machine. It unlawfully attempts to cover by a patent the function performed by an apparatus and an abstract principle and law of nature. The patent, also, is a fraudulent attempt on Bell's part to enable him and his assigns, by the aid of their vague and general descriptions, to avail themselves of subsequent discoveries and inventions and interfere with other inventors. Bell in his specification and claim nowhere pointed out or described any apparatus or device or means for carrying his pretended invention into effect in such a way that the same can be constructed or operated by others.

The next matter discussed in the bill is that of priority of invention of the telephone. Bell, it is declared, was anticipated by Reis, Cromwell Fleetwood Varley, Antonio Meucci, Elisha Gray, Thomas A. Edison, Asahel K. Eaton, and many others. The discovery is either the property of one of these or else has been abandoned and is free to all. The telephones made by prior inventors are in existence and demonstrate that they are such. All the inventions and discoveries and parts claimed by Bell as new and original had been long before his patent known and described in various publications. Every material part of his alleged invention had been long before patented by others. Bell, in order to fortify himself, further imposed on the Patent Office on Jan. 15, 1877, when he made another application and had issued to him on Jan. 30, 1887, patent No. 186,787, which purports to be granted for specified devices and apparatus for transmitting speech by electricity. Every material part of these was taken by him bodily from well known and existing apparatus, devices, and plans invented by others for the purpose. He framed his claims in this second patent so as to give him and his associates the practical monopoly of well known and essential devices used and combined in all instruments for the transmission of articulate speech by electricity. Those claiming under him hold that the two patents give them not only a monopoly of the art of transmitting speech electrically, but also of all the essential parts of any apparatus by which such transmission can be effected. Bell appropriated Prof. Amos E Dolbear's magneto telephone, which is now used as a receiver by the American Bell Company. Prof. Dolbear exhibited a complete, perfect articulating telephone on Sept. 20, 1876, combining all the appliances now used in that of the company mentioned under Bell's patent of Jan. 30, 1877. Dolbear was about to get a patent for his telephone and communicated with a friend named Percival V. Richards. The latter was a friend and associate of Bell, and inadvisedly told the latter of Dolbear's invention, giving him also a description of it. Gardner G Hubbard, Bell's father-in-law, shortly afterward told Richards that Bell had obtained a patent on the devices of Dolbear over two years previously. This statement was untrue, but Dolbear believed it, and for a long time ceased his efforts to patent his telephone. Bell and Hubbard, after getting Dolbear's invention, went to Washington and obtained the patent No. 186,787 on it. Bell simply appropriated Dolbear's invention. Professor Dolbear soon after made a contract with the Gold and Stock Telegraph Company of New York for the manufacture and sale of his telephones, and they were sold for nearly three years. Then the Western Union Telegraph Company, which controlled the Gold and Stock Company, agreed with the American Telephone Company on a compromise in what is known as the Dowd case, appropriated to themselves the entire profits of telephony in the United States, and suppressed the fact of Dolbear's invention and Bell's misappropriation of it. In further pursuance of this scheme the telephone company and the Western Union got up a collusive interference case in the Patent Office between Bell and Dolbear. The latter was not represented except in name, and the case was prosecuted so as to suppress the fact that, as against Bell Dolbear was the inventor. The counsel on both sides were in the same interest, and so it was decided that Bell was the inventor of the telephone. For this fraud the patent No. 186,787 was invalid and should be canceled.

The telephone device claimed by Bell was previously used, it is declared, by the following persons:

James W. McDonough, Daniel Drawbaugh, Elisha Gray, Thomas A. Edison, Amos E. Dolbear, Philip H. Van der Weyde, Adolph Ott, W. F. Channing, Benjamin F. Edwards, James Hamblett, Jr., Edward Farrar, Antonio Meucci, W. S. Vollker, Edward E. Pickering, Charles R. Cross, Alfred C. Holcomb, Ellen Holcomb, Philip Reis, Royal E. House, David Hughes, Asahel K. Eaton, Dr. S. D. Cushman, Signor Mouzetti, Paul La Cour, Prof. Yates and Cromwell Fleetwood Varley.

In explaining why various corporations are made respondents, and showing why the suit is properly brought in Ohio, the bill of complaint sets forth:

"And your orator shows to your Honors that by mesne assignments in writing, in due form made and executed by the said Bell, and duly recorded in the Patent Office of the United States, the said Alexander Graham Bell transferred the said letters patent to the American Bell Telephone Company, No. 174,465, dated March 7, 1876, and also the said letters patent, No. 186,787, dated Jan. 30, 1877, and each of them, and has become divested of all right, title and interest therein, and has transferred his title in and to said letters patent, and in and to the matters and grants therein contained, to the American Bell Telephone Company.

"That your orator has made the said Alexander Graham Bell defendant in this bill, not by reason of any interest, right or title in said patents, as he has become divested of all right, title or interest therein, but that he may, if he so choose, appear herein and assert any pretended right, claim or interest which he may believe himself possessed of, and be heard herein.

"Your orator further shows that the said defendants, the American Bell Telephone Company, duly incorporated under the laws of Massachusetts, and the Central Union Telephone Company, a corporation duly chartered under the laws of Illinois, and the Erie Telephone and Telegraph Company, incorporated under the laws of the State of Massachusetts, and the Central District and Printing Telegraph Company, incorporated under the laws of the State of Pennsylvania, and the Cleveland Telephone Company, the City and Suburban Telegraph Company, the Miami Telephone Company, and the Buckeye Telephone Company, the latter four incorporated under the laws of Ohio, and the defendant, Alexander Graham Bell, all of whom are made defendants to this bill are present, and are found and have property and do business in the State of Ohio, within the jurisdiction of this court, and are now engaged in carrying on business of telephony and maintaining a close monopoly thereof in the said districts, that is to say, in said eastern and western divisions of said Southern District and in said Northern District of Ohio, under and by virtue of said patents to said Bell, and by the means and in the manner hereinafter set forth."

The American Bell Company, it is further stated, owns all the telephone instruments used in the business in this country. The number of these in Ohio is over 20,000. The local companies own the poles and wires. The parent company furnishes the franchise and exclusive right of the patents and the instruments, together with a contract stipulation that it will supply counsel and maintain all suits and do all things to make the business an exclusive and close monopoly without charge to the local company. The local companies divide the profits with the parent concern.

The American Bell Company is entitled to and has an interest in the property, business and right of the other companies made defendants in this action. The bill goes on to say that the telephone having become a necessity, the American Bell Company by virtue of its patents is demanding and receiving large sums of money for the use of its telephones. It is oppressing the people upon what are believed to be invalid grants. The amount involved in the present action is over $10,000. No private suit can be brought to determine whether the patents of Bell were fraudulently obtained as against the United States, and whether they should be vacated and declared null as against the people of the country. Considering these things and that the patents still remain of record as apparently valid, the present proceeding is declared to have been instituted because the complainant "is remediless in the premises under the rules of the common law, and can only have relief in this form of proceeding."

The prayer of the complaint is that the defendants make answer to the complaint; that the Bell patents be declared null and void; that it be declared that the patents were wrongfully procured to be issued by means of fraud, false suggestion, concealment, and wrong on the part of Alexander Graham Bell, and that there is nothing in the patents or specifications on which a monopoly of a patentable invention could have been lawfully granted to him, and that the patents be repealed and the record of them be expunged; that the original letters patent be surrendered to the court, so that the Patent Office seals may be removed or destroyed. If however, the court should determine that the patents are not wholly void and not deserving to be wholly repealed, but are merely partly so, a decree is asked for repealing such parts as the court may deem void, "and that the said patents and each of them be treated as contracts and be re-formed, limited, and modified as in equity and good conscience they ought to be." An injunction is also asked restraining the defendants, their agents, etc., from setting up any pretense or claim under the Bell patents, or from pleading these in judicial proceedings as evidence of any grant or right conferred on Bell or his assignees.

TELEGRAPHIC

.... There really seems to be no limit to the possibilities of science. The London *Times*, for instance, in its birth notices, announces: "To Lady ——, a daughter; by cable." What next?

.... A steamer lighted by electricity passed through the Suez Canal Monday night, March 22. This is said to be the first instance of the kind.

.... New Bedford has set the example for New England cities by being the first to grant a street railroad company permission to run its cars by electricity.

.... A certificate of incorporation of the Empire Automatic Fire Alarm Company, to operate in Rensselaer and adjoining counties, has been filed. The incorporators are George P. Ide, Gardner Earl and A. N. Belcher. The capital stock is fixed at $100,000, divided into 1,000 shares, with a provision to increase the stock to $250,000 if desired. The company's principal place of business is in Troy, N. Y.

.... At the last annual meeting of the Telegraphers' Mutual Relief Association of Washington, Wm. H. Young was elected president, James B. Anderson, re-elected secretary and James H. King, re-elected treasurer. The executive committee consists of the president and secretary, Messrs. A. J. Lombard, W. B. Harveycutter, J. C. Noyes, L. M. Smith and Harry W. Dowling. The secretary's report showed present membership of forty-nine; $170 paid out in benefits the past year and cash in the treasury, $476.

.... In the Court in General Term, Justice Merrick, of Washington, D. C., has delivered the opinion of the court in the case of R. C. Hewitt and others against the Western Union Telegraph Company to restrain the erection of telegraph poles in the city. In the Equity Court Justice Hagner granted the injunction, but the court in banc has reversed this decree and directed the dismissal of the bill with costs.

.... Among the latest inventions is that of a match which may be used over again an indefinite number of times. The wood is soaked with a peculiar chemical solution which renders such re-using practicable. Even such an insignificant item as the saving of the amount of wood in a match, will in the course of a few years have quite a visible effect upon our forests, for it is estimated that the matches consumed in the United States each year require wood to the value of $3,298,000 in their manufacture.

.... Railroad men are engaged in agitating the question how to provide for electrical signals between conductor and engineer, a necessity which is becoming as grave in its demands as was the adoption of a brake which would act as a protection to human life. The present system of bell-cords is inadequate, made so by the increased number of cars now composing the average passenger train. When one baggage-car and two coaches—at the outside three coaches—composed the regular trains, it was no difficult matter to signal the engineer with the regulation bell-cord. To-day this is all changed, and standing upon the sixth or seventh coach, the conductor cannot tell whether he has given the signal or not, while at the rear of the train the bell-cord is a useless appendage. Superintendent Hammond, of the Missouri Pacific telegraph service, is of the opinion that telephone communication can be established on moving trains as easily as in regular telegraph service, which he pronounces a success. He considers the establishing of communication between engineer and conductor, which can at all times be relied upon, to be of far more importance than telegraphing from a moving train. The only difficulty to be overcome is the connection between cars.

familiar with matters relating to telephone inventions would seem to be the one most likely to give quick and intelligent despatch to the business.

To assume that there is any prejudice in our favor in the various courts before whom our suits have been heard, would be an indictment of a large part of the judiciary by the Executive, for which there can be no justification.

Regarding the newspaper agitation that has attended this Pan Electric exposure, it is proper to say that we have taken no part in it, directly or indirectly. While it would have been wholly within our right to place all the information within our reach in the possession of the press, we felt that having adopted the course of going directly to the Government with the facts as we understood them, it was the proper course, at least under the then existing circumstances, to take no part in any discussion in the newspapers.

Yet it has been impossible to avoid a sense of outrage at the whole transaction, and the support it has received in official circles, which made it difficult to maintain silence, and we feel that this full statement of the matter is due to the stockholders.

Last summer, Mr. Vail, feeling that a due regard for his health required relief from the arduous duties of General Manager, resigned that position, which he had held with great benefit to the company since its formation. Being desirous of availing ourselves of his energy and wide knowledge of the telephone business, we made arrangement with him by which he undertook the general supervision of the American Telephone and Telegraph Company, as president, and the more immediate supervision of the affairs of the New York Company. He will also give such attention to any other of our interests as we may from time to time desire.

Mr. John E. Hudson, who has been with us as counsel for years, accepted the position of General Manager and Solicitor, and his familiarity with our affairs has enabled us to make a change in management with the least possible inconvenience.

Mr. C. J. French, who formerly represented our interests in various of the important Western companies, has been elected Assistant General Manager in place of Mr Madden, who also resigned during the year.

Mr. Hudson, has, since last September, performed the duties both of General Manager and Attorney, but this involved altogether too much labor, and Mr. Geo. V. Leverett has lately been retained as attorney and will relieve Mr. Hudson of a large part of the legal work of the office.

The Western Electric Company has been brought into a much better condition than it was in a year ago, the company being free from debt, and possessed of a substantial surplus after paying regular dividends of one and a half per cent. per quarter during the year. The condition is due in a great degree to the careful management of Mr. W. S. Smoot, who assumed the presidency of the company in January, 1885, and whose recent death has deprived us of a most faithful, upright and efficient officer.

The laboratory has conducted a large number of experiments in connection with patent litigation. In addition to this, further examination has been made into the matter of underground work, and cable systems, and a series of experiments are in progress. Further experiments are also in progress in reference to underground work, in connection with overhead systems.

The Patent Division has proceeded with its work of digesting and indexing, for easy reference, patents of the United States and Great Britain relating to electricity, and in bringing forward the history of the development of the telephone system, and in examining and reporting upon the novelty and value of various inventions submitted to the Company. This division has also, during the year, prepared specifications and applications for patents for inventions made by employees of the Company and others, which have been thought of sufficient value to patent.

Mr. Gilliland resigned his charge of the Mechanical Division about Nov. 1, 1885, and Mr. H. V. Hayes has assumed the position.

The Mechanical Department and Testing Department, heretofore in separate buildings, have been combined and have recently been moved to new quarters, with great gain in the matter of convenience, but without additional expense.

In April, 1885, the State of Indiana passed a law restricting the price of rental of a telephone to $3.00 per month and $2.50 each, where two are used. This was done against the almost unanimous report of the committee which had examined the subject, and before whom careful testimony had been placed as to the cost of telephone service.

This raised at once two questions of the highest importance in our licensees:

First. The question of the right of the Legislature to make such restrictions.

Second. The question of public policy in respect to such legislation.

A case testing the validity of the law was brought, and carried up to the Supreme Court of Indiana, and the Central Union Company doing the telephone business of Indiana, gave testimony beyond dispute that telephone service in Indianapolis and other cities actually cost that company more than $3.00 per month per subscriber. That Court has recently decided that the law is valid, but has accompanied this decision by language which implies a doubt whether the law is either wise or just. The Court based its opinion largely upon the so called police power of the State, which is said to confer the right to control matters affecting the safety and convenience of the public, and quoted the case of a restriction enforced against the patent owners of a dangerous oil in behalf of its position.

But there is no question as to public safety involved in the telephone law, and as the telephone is certainly a convenience to the public, of less consequence than the supply of food and clothing, it does not seem probable that the right to regulate the telephone business, even without considering the question of patent right, exists, unless the State has the power to regulate prices of all other commodities. If this general power does exist, surely the patent right must give some protection to a business which wholly depends for its peculiar value upon patented inventions.

The Court made the distinction that the price for the right to practice the invention could not be interfered with, but that as soon as the invention was embodied in a tangible article like the telephone, the State possessed the right to limit the price for the use of it. This is to assert that the State has only to take one step round, in order to practically accomplish that which the Court itself says it must not do, and this whole ground is so opposed to the generally accepted theory upon which patented articles have been bought and put into use, and to the whole theory of the patent law, which purports to ensure full protection for the exclusive use of the invention during the life of the patent, that it seems incomprehensible that the view of the Indiana court can be correct.

In consequence of this decision the Central Union Company is obliged to close its exchanges in the principal cities and large towns; there seems to be no other course, unless the company is willing to do business at a heavy loss, until the rate law can be repealed. The public will necessarily be put to serious inconvenience, and the Telephone Company is helpless to give relief. In Ohio and New Jersey, similar bills which were before the Legislatures of those States have been rejected or postponed, and we have every confidence that the same result will be reached in several other States, including Massachusetts, where the same legislation has been attempted.

The Indiana case is to be appealed to the United States Supreme Court, and the result will be awaited with anxiety by many others than those interested in telephone property. If the States possess such right as is claimed by the Indiana Court, the motive of public policy should still operate against its exercise. Why should the telephone business be regulated as to price more than other industries? The reasons offered are that telephone companies are monopolies, and that they have been granted certain privileges of location, but as they are monopolies only by virtue of the patent system, which is everywhere accepted as a part of our public policy to which all the States are committed, no State in fairness ought to destroy that which this patent system has created, and the privileges of location which have been granted them are so precarious, that sufficient obstacles are already placed in the way of conducting their business, by their being obliged to put their money into plant of such uncertain tenure. Sound public policy is surely against the regulations of the price of any class of commodities by law. If it is admitted with telephones, it may presently be proposed for anything else which the public wants.

In the discussion of this matter, the circumstances that these patents are properly bought and paid for, seems often to be wholly overlooked by those who are proposing to distribute the benefits of the telephone to the public. It is the buyer using his majority vote to fix prices, without reference to the rights of the seller. It is often asserted that telephone rates are too high, but the assertions are unaccompanied by any proofs, and those who make them do so without that knowledge of the business necessary to a fair judgment.

As the stockholders generally have not been able to acquaint themselves with these matters, it may not be out of place to say a few words about this question.

Had an offer been made in the first place to put a wire, a switch apparatus and operators, day and night, at the service of each subscriber, and to charge not over five cents per connection within usual exchange limits, can it be doubted that such a charge would everywhere have been accepted as moderate? In fact the cost to the subscriber for exchange service varies from two to seven cent per connection, according to amount of use and quality of service required, and the average is not far from four cents. The price of connections from one exchange to another is from ten cents upwards, according to distance, which compares most favorably with telegraph messages, since immediate response is secured and a conversation of three minutes or even more, allowing the exchange of several hundred words, instead of the ten word message of common use in telegraphy, with considerable delay in getting replies. A telephone subscriber's wire, too, is used on an average but about five times a day, and must be maintained in idleness the rest of the time, while a telegraph company only maintains as many wires as it expects to keep busy. In Boston and its branch offices alone, for example, the Telephone Company maintains 4,565 miles of wire which are mostly in idleness nine-tenths of the time.

Different qualities of telephone service are just as necessary as different qualities of clothing, food, or railroad service, and prices of telephone exchange service must vary as surely as prices of other commodities, unless cities are willing to content themselves with the kind of equipment and service which answers in a village, which they are not. In a small town one can only reach perhaps one to two hundred persons, in a city as many thousand—this is worth the difference, especially since the apparatus must be much more costly throughout.

It is natural that the fact that the price of telephone service increases with the number of subscribers instead of decreasing should not be understood by those outside of the business; and perhaps if the practice of charging in proportion to the number of persons reached, in other words, in proportion to the facilities placed at the disposal of a subscriber, had been adopted, the reason for the increase in price would have been easier to comprehend.

The calls increase very rapidly with the increase of subscribers, and this means more operators in proportion, and the operators are a large part of the expense.

If those who are interested in this problem would study it out with the assistance of practical telephone men, instead of assuming that all telephone managers are trying to deceive, the matter would become much better understood.

Regarding this whole attempt to restrict or harass telephone companies by attacks, such as have been common in State legislatures of late, it may be said that there is probably in the public mind a general misunderstanding of the questions involved.

The facts that control telephone expense are as yet imperfectly understood by even the best telephone men, and they are constantly perverted by persons who have adverse interests, or who for improper purposes have instigated legislative attacks upon telephone companies.

The telephone situation is worthy of more careful attention than it has received at the hands of the public. Its features are peculiar, and the development of telephone facilities is certainly of high importance to our people. Although in the ten years that have passed since the invention became public, 156,000 miles of telephone wire have been built, over which 275,000,000 communications now pass annually; we are in reality only at the threshold of the business. It is possible already to talk with ease between Boston and Philadelphia over our experimental wire, yet the connection of our principal cities and large towns by thoroughly practicable telephone systems has, in fact, only been begun.

With the improvements which are rapidly coming into use, the aim must be nothing less than to provide a complete working system throughout the United States, which will give facilities for instant conversation between all points within many hundred miles of each other, such as is now possible within the limits of a single exchange. This cannot be accomplished by competing companies, each reaching only part of the persons wishing to become subscribers to such a system. The service is divested of half its value the moment half the people retire to a second system, and of much more should there be still further sub-division. In other words the value of the thing consists in placing each person in the same system with each other one, and this can only be done under one general plan.

The contracts which we have made with our licensees are all shaped with this complete general telephone service in view. For purposes of inter-communication between existing smaller systems, it is arranged that all shall work together, and the fact that the telephone companies throughout the land have been held under such a general plan by the force of a government patent, has been and is of the highest importance to the public, for in no other way could even the present condition of telephone development have been reached so soon, or without great confusion among competing companies and the multiplication of the wire nuisance, which would have been intolerable.

To any one who will think what it would mean, if instant verbal communication could be had by any person here with every city and town in New England, and as far as Philadelphia, perhaps even Washington and Chicago, with similar facilities in all parts of the country, it must be clear that this is something well worth the risk of money, thought, and labor by the companies; well worth encouragement from the people. The work that has been done is at least some guaranty of what will follow, if the protection promised by our patents is not interfered with. The public is ripe for the use of such a convenience, the inventive talent of the country is providing new methods for making it available,—will the legislatures interpose to prevent all progress, through misconception of the problem, or because misled by interested parties?

What has already been accomplished has been under every discouragement that can be thrown upon a property resting on patent rights. But a small percentage of patented inventions prove valuable, and all such are usually compelled to run the gauntlet of lawsuits from pretenders, so long as their patents live. Capital, therefore, is timid about such investments, and nothing but the expectation of large temporary returns will bring it out for the development of a business like this.

While it is true considerable returns have been received upon our property since 1883, it is equally true that for years we were without dividends or other income from our investment; our patents have but seven years more to run, and we are still working, as always before, under a heavy fire and an expenditure for defence which nothing but a prospect of liberal returns would, for a moment, justify.

To undertake such a work as has just been outlined, large sums are required for construction. It is within the power of State Legislatures to so alarm capital that might be attracted to such a business, that it would be wholly useless for a time to attempt any important work of the kind suggested. The attack upon rates is one of the most direct methods of removing all inducement to extend telephone facilities; but, even if the right to absolutely regulate this matter were conceded, the question whether the few thousand persons who now are connected with telephone exchanges shall have telephone service a little cheaper than at present is of trifling importance to the country, compared to the completion of a telephone system adequate to the needs of the whole people.

The directors feel that the outlook ahead is promising, that there is good prospect of an early favorable termination of our most important suits, and strong reason to hope that further unjust legislation will not be seriously attempted, so that we may look forward to an opportunity to devote ourselves to the extension and completion of our telephone work.

For the Directors,

W. H. FORBES,

President.

Death of Charles W. Ross.

A painful duty arises this week in chronicling the demise of Mr. Chas. W. Ross, of Columbus, Ohio, who was at the time of his decease, assistant general superintendent of the Central Union Telephone Company.

Mr. Ross' death was sudden and a surprise to every one. On Tuesday, the 16th, he was in Chicago in usual health. On the evening of that day he left here to be in Cincinnati on Wednesday, in Columbus on Thursday, and back to Chicago on Friday to witness the experiments with the Wiley-Smith induction telegraph system between this city and Milwaukee, on which occasion he anticipated a pleasant reunion with a great number of old telegraph and telephone friends.

An attack of neuralgia of the stomach prevented his return here, as anticipated, and the fell disease, despite the best efforts of attending physicians progressed rapidly, until 5 o'clock on the morning of the 25th when the climax was reached, and death put an end to his suffering.

Probably, for one of his years there were few better known practical electricians than he, who was everywhere known and beloved as Charley Ross. At an early age, he was prominent as a telegraph employe, then manager, eventually an assistant superintendent under Superintendent Williams, of the Western Union, at Columbus. When the telephone mystery first came to the surface, Mr. Ross became interested and created an exchange at Columbus, eventually becoming superintendent of the Midland Telephone Company. In due time, this, with other companies, was incorporated into what is now the Central Union Company, and in this organization Mr. Ross was made one of the assistant general superintendents, with headquarters in Columbus.

In every position which Mr. Ross was called to fill, his upright, manly bearing, honest intent and cheerful disposition made hosts of friends for him. Ever on the side of right and justice, he was always ready to espouse the cause of the oppressed, no matter how humble, and do battle in defending the just against the unjust.

Chemical Electric Light and Power Company.

Editors Electrical Review:

As shown in the accompanying cut, there are twelve cells *Volta Pavia* connected in series, each giving 2 1-5 volts and 5½ amperes; consequently we have the *E M F* of twelve and the ampere current of one, or very nearly ¼ horse. A plant of twelve cells is the one mostly in use, as it takes up but little room and is capable of supplying four 15-volt lamps of 8 candles each, or six 5-candle-power lamps. Each cell has a tight fitting cover, which at the same time is the positive pole, consisting of thirty one-half inch carbon pencils, connected together in a substantial manner. By the use of these, in combination with other mechanical arrangements, the internal resistance of each cell has been brought down to 5-100 of an ohm; and this, with its high electro-motive force and remarkable constancy and durability, makes it the most efficient cell ever devised. The jar or box is of wood, lined throughout with lead; all its joints are burnt or welded, and it is practically indestructible.

Inside of the jar sets the especially devised large porous cup, which holds the zinc in its position and automatically amalgamates it, while its containing liquid has always a certain relative proportion to the outside depolariser or *Volta Pavia*. When the zinc has been inserted in the cup and the solution added to the jar, the positive pole or cover is placed over the whole; and only two connections then appear, one the carbon, and the other the zinc. The remarkable duration and consecutive power of this battery has already been mentioned in this paper. Lamps in the elevator in the Mutual Life Building in Boston were burned for 348 hours, with one charge of *Volta Pavia Q. B.* solution, exceeding all previous records by 300 hours. At the company's laboratory and factory, 109 Court street, Boston, there is a complete plant in operation, where lamps of various candle-power are shown at will. The Chemical Electric Light and Power Company has devoted its time up to now, especially on lighting and running motors, for the reason that if it is possible to do the above work, it is possible to do everything else in the line of battery work. Twelve cells will run a motor of sufficient strength to drive a small lathe, a sixteen-inch ventilating fan, or any machinery requiring that amount of power.

Economical regulators go with every installation, so that it is possible to run from one-light candle-lamps up to the full number of lights, and still keep each individual lamp at its normal candle-power, and this economically, no artificial resistance of any kind being introduced with this system, for the reason that the generator being composed of a series of small generators, we are able to control the aggregate, or any part of the aggregate, economically at will. The company has found it practical to fit up several rooms in a house with incandescent lamps and only have the battery capacity for lighting one room, so that by turning a switch anyone of the rooms can be lighted. Wires are also run and attached to a small motor for sewing machines, so that in the day-time when no lights are in use, six cells are utilized to operate the sewing machine.

The applications of this battery other than furnishing lights and power are numerous, and require no enumeration here.

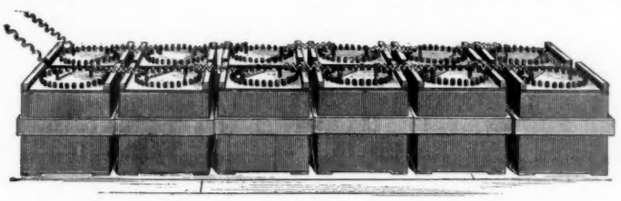
CHEMICAL ELECTRIC LIGHT AND POWER COMPANY.

Boston, Mass., March 27, 1886.

* * It is probable that no railroad will be built this year between Lynn and Nahant. Inhabitants of the latter place intend to control the matter of transportation themselves. The town has almost no residences that are not owned by the wealthy families, and they of course have no desire for a railroad which may lessen the attractions of their beautiful peninsula. The Enos Elevated Railroad Co. have made some efforts with a view to introducing their system in this town. Whatever may be the system used the motive power will undoubtedly be electricity.

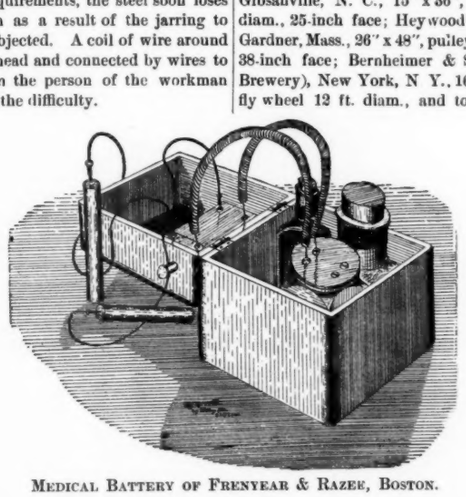
Executions by Electricity.

Dr. Southwick, of Buffalo, proposes to execute criminals by means of electricity, by which death would be instantaneous. His idea is to use an ordinary chair. In his city, he states, a wire could be run from the electric light works to the jail. The man would sit in the chair with his head resting against its back. The wire entering an insulated substance, such as rubber or glass, would constitute the positive pole. By placing the man's feet upon a metallic plate a connection would be formed with the poles. At a signal, a switch in another room could be turned The current would enter at the base of the brain, the center of the nervous system, and pass through the man. The heart would stop beating, and a complete paralysis would ensue. Senator McMillan, of the Buffalo district, has introduced in the Legislature a bill which provides for the appointment of a commission to investigate and report the most humane method of inflicting capital punishment.



VOLTA-PAVIA BATTERY OF THE CHEMICAL ELECTRIC COMPANY OF BOSTON.

—— A want much felt, especially by bill posters for a magnetized tack hammer, has not yet been met. It is often desirable to drive tacks at a height which cannot be easily reached While hammers can be made which answer all requirements, the steel soon loses its magnetism as a result of the jarring to which it is subjected. A coil of wire around the hammer head and connected by wires to the battery on the person of the workman might relieve the difficulty.



MEDICAL BATTERY OF FRENYEAR & RAZEE, BOSTON.

Electro Medical Apparatus for Family Use.

A more extended use of the curative and remedial effects of the electric current has in the past been prevented by complicated and inconvenient forms of apparatus. An exceeding compact, simple and safe form of electro-medical apparatus is that illustrated in this issue and devised by Prof. Finger, and sold by Frenyear & Razee, 352 Washington street, Boston. With this battery, the application of electricity to cure neuralgia, headache, etc., or when used in connection with the bath, can be easily made by any person. An electric hair-brush connected with one pole of the battery while the other is held in the hand, can be slowly moved through the hair, the metallic bristles conveying the current to the scalp. The whole apparatus is inclosed in a neat cherry-wood box.

—— Edward Atkinson says that substantially all the commercial failures have been simply a removal of so much rubbish; that the railway systems of the United States are paying a full income on the actual dollars invested; that every sign points to increasing activity in our industries, and that, should there be a sudden start, a scarcity of labor would be developed.

—— Messrs. C. E. Jones & Bro., well-known electricians and electrical dealers, of Cincinnati, Ohio, have removed to 55 and 57 Longworth street, and are again in good order for business, notwithstanding their severe loss by fire several weeks ago. These gentlemen, with their usual energy, have made quite a number of improvements and several valuable additions to their equipments. This firm is deserving of great credit for its prompt resumption of business, after an almost complete destruction of property by fire.

—— Wm. A. Harris, builder of the celebrated Harris-Corliss automatic steam engines, so favorably known in the electric lighting field, has recently received orders for the following engines: S. H Greene & Sons, River Point, R. I., 18″x48″, pulley 15 ft. diam., 37-inch face; New Bedford Manufacturing Co., New Bedford, Mass., pair of 20″x48″, pulley 20 ft. diam., 52-inch face; F. W. Bird & Son, East Walpole, Mass., 24″x48″, pulley, 16 ft diam., 31-inch face; R. D. Wood & Co. (Camden Iron Works), Camden, N. J., 18″x48″, pulley 15 ft. diam., 25-inch face; Chateaugay Ore and Iron Co., Plattsburgh, N. Y., 24′x48″, pulley 17 ft. diam., 31-inch face; James N. Williamson, Gibsanville, N. C., 15″x36″, pulley 11 ft. diam., 25-inch face; Heywood Bros. & Co., Gardner, Mass., 26″x48″, pulley 16 ft. diam., 38-inch face; Bernheimer & Schmid (Lion Brewery), New York, N Y., 16″x36″, plain fly wheel 12 ft. diam., and to weigh 8,100 lbs.; Tillotson & Power, Pittsfield, Mass., 16″x42′, pulley 13 ft. diam., 25-inch face; Boston Rubber Co., Boston, Mass., 18″x42″, pulley 15 ft. diam, 25-inch face; W. O. Atwood, Guilford, Conn., 14″x36″, pulley 16 ft. diam., 25-inch face; Rhode Island Granite Works, Westerly, R. I., 16″x36″, pulley 12 ft. diam., 25-inch face; Brooklyn Gas Fixture Co., Brooklyn, N. Y., 12″x36″, pulley 11 ft diam., 21-inch face; Wm. H. Crossman & Bro., New York, N. Y., 18″x42″, plain fly-wheel, 18 ft. diam., and to weigh 20,000 lbs.

—— An electrical tree has been found in New Guinea by two German explorers. When the explorers reached a spot twelve days distant from the coast, they found their compass useless, owing to the presence of a tree which so completely possessed the properties of a high-charged electric battery that one of the travelers was knocked down when he touched it. Analysis showed the tree to consist of almost pure amorphous carbon, and it has been named *Glassia electrica*.

—— The Shultz Belting Company, of St. Louis, Mo., has just published a new book, of value to all engineers and machine men. This will be sent free to all applicants.

ELECTRIC LIGHT NEWS

—— The Brooklyn Electric Construction Company are putting in a plant of 125 city lights in Mobile, Ala.

—— The death is announced, in France, of M. Auguste Guérout, well known in connection with *La Lumiere Electrique*.

—— The Faraday Cable is now to be generally introduced. Attention is called to the manufacturers' announcement on page 15.

—— During January last the receipts of the Parisian Gas Company were diminished one per cent. This was due to the growing usage of the electric light.

—— The Toledo Electric Light Company has been requested by the City Council to place four electric lights on the Cherry street bridge, to be lighted every night in the year. In all cities where there are bridges the electric light is being generally adopted for lighting them.

—— The Cleveland Electric Light Company (Thomson-Houston system) has now 300 arc lights in use in that city, all private lights. Mr. F. J. Stafford is the pushing manager of this company, and is well pleased with the growth of the business.

—— The Zell Boiler Company have a 250 horse-power boiler, running two 150 horse-power Armington & Sims engines, at the works of the Incandescent Electric Light Company, of Jackson, Mich. The Dickson Manufacturing Company, of Scranton, Pa., have exclusive control, and now manufacture the Zell boiler.

—— In many places it is desirable to drive dynamos for electric lighting by a power which is rendered unsteady by a varying load on same line of shafting or by an engine making comparatively revolutions per minute. The fly-wheel of an engine is only a means to equalize the speed by storing up motion at one part of the stroke and giving it out at another. This may be done to even better advantage by placing a heavy fly-wheel on the shaft of the armature, or on the line of shafting which drives the dynamo. In this way gas engines at the Philadelphia Electrical Exhibition where shown running incandescent lights, which were remarkable for their steadiness.

—— The Electrical Committee of Councils, of Philadelphia, at a recent meeting, considered the ordinance authorizing the Chief of the Electrical Department to lay underground conduits for electric light wires on Broad street, north from Columbia avenue, as far as an appropriation of $2,500 will go. Chief Walker stated that the money could be spared from the annual appropriation, and that if the city was to go ahead and operate such a line the light could be had for 40 cents per lamp per night, whereas the only bidder for supplying the lights in that vicinity asked 75 cents. The members of the Committee expressed themselves that this would be a good opportunity to test underground electric lighting, and the ordinance was directed to be reported with a favorable recommendation.

—— The new incandescent lamp of Max Neuthel, which has been patented in Germany, dispenses with a vacuum. The filament consists of a mixture of conductors and non-conductors of electricity, being composed of magnesia and porcelain clay, saturated with platinoridum salts, and afterward heated to incandescence in order to reduce the absorbed salts to the metallic state. The inventor supposes that the electric spark jumps from one particle to another, causing a heating action of the non-conducting substances, which are thus brought to incandescence and emit a strong, steady light. The filaments are to be strengthened, when deemed necessary, by a covering of chrome, the melting point of which is still higher than that of platinum.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 23, 1886.

338,260 Armature for electro-magnets; Charles A. Gaiser, Edwardsville, Ill.

338,261 Armature for electro-magnets; Charles A. Gaiser, Edwardsville, Ill.

338,263 Telephonic transmitting apparatus; Jas. T. Guthrie, Leesburg, Ohio.

338,292 Watchman's time detector; Lloyd W. Pennell, Braintree, Mass., assignor to the Tarbox Time Register Company, Portland, Me.

338,293 Circuit-controlling device for watchmen's time recorders; Lloyd W. Pennell, Braintree, Mass., assignor to the Tarbox Time Register Company, Portland, Me.

338,313 Electric railway system; Frank J. Sprague New York, N. Y., assignor to the Sprague Electric Railway and Motor Company.

338,315 Watchmen's time recorder; James E. Tarbox and Eugene H. Taylor, Lynn, Mass., assignors to the Tarbox Time Register Company, Portland, Me.

338,320 Dynamo electric generator; Charles J. Van Depoele, Chicago, Ill.

338,321 System of generating electrical currents; Charles J. Van Depoele, Chicago, Ill.

338,326 Electric time register and alarm; Chas. W. Whited, Battle Creek, Mich., assignor of one-half to W. H. Pettibone, same place.

338,328 Telegraph register; Louis Winterhalder, Brooklyn, assignor to the New Haven Clock Company, New York, N. Y.

338,329 Telegraph register; Frank B. Wood, New York, N. Y., assignor to the New Haven Clock Company, New Haven, Conn.

338,333 Regulator for dynamo-electric machines; Royal E. Ball, New York, N. Y.

338,343 Printing telegraph; Stephen D. Field, New York, N. Y., assignor to the Commercial Telegram Co., same place.

338,344 Printing telegraph; Stephen D. Field, New York, N. Y., assignor to the commercial Telegram Co., same place.

338,352 Electric lamp; George A. Mayo, Lynn, assignor by mesne assignments to the Mayo Electric Mfg. Co., Boston, Mass.

338,375 Electro-magnetic reciprocating engine; Charles J. Van Depoele, Chicago, Ill.

338,383 Dynamo-electric machine; Charles Batchelor, New York, N. Y.

338,439 Electric signaling apparatus for railway trains; Wm. F. Ray, Springfield, Mass.

338,485 Street conduit for electric and cable railways; Henry T. Clay, Philadelphia, Pa.

338,491 Telephone receiver; John E. Dann and John Lapp, Honeoye Falls, N. Y.

338,492 Telephone transmitter; John E. Dann and John Lapp, Honeoye Falls, N. Y.

338,518 Electrical subway; Charles C. Gilman, Eldora, Iowa.

338,522 Electro-magnetic poise adjuster; Chas. W. Hastings, Brooklyn, N. Y.

338,542 Manufacture of hard carbon; James J. McTighe, Pittsburgh, Pa.

338,549 Electric meter; John S. Raworth, Manchester, County of Lancaster, assignor to Siemens Brothers & Company (Limited), 12 Queen Anne's Gate, Westminister, County of Middlesex, England.

338,550 Automatic electric coupler; John S. Raworth, Manchester, County of Lancaster, assignor to Siemens Brothers & Company (Limited), Westminister, County of Middlesex, England.

338,556 Conduit for electric and cable railways; Elias E. Ries, Baltimore, Md., assignor of one-half to Albert H. Henderson, same place.

338,588 Electric meter; Sebastian Z. de Ferranti, West Kensington, County of Middlesex, England.

338,593 Fire alarm; Alma C. Gordon, Dunlap, Illinois.

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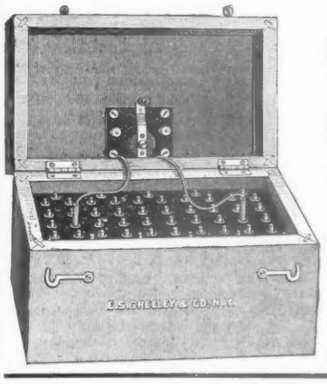

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9 cell Battery,	4½x5½x5 inches	12 00
6 cell Battery,	4½x4½x5 inches	10 00

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H. M. LINNELL, Selling Agent, Hartford, Connecticut. T. H. BRADY, Patentee and Sole Manufacturer, New Britain, Connecticut.

HARTFORD, CONNECTICUT, *December* 29, 1885.

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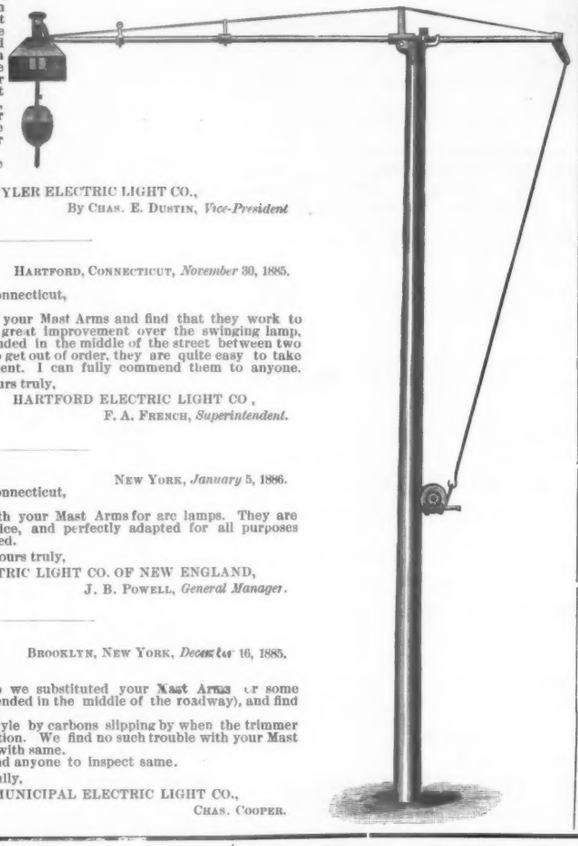
Dear Sir.—We take pleasure in giving you our experience with the Electric Light Mast Arm manufactured by you. We have had experience with mast arms manufactured by others and can unhesitatingly pronounce yours the best, both as regards ease in working and permanent durability, of any we have used. In connection with this we will say that several of our workmen have invented mast arms that we could undoubtedly manufacture at a trifle less than we can purchase yours, but as an evidence of our belief that yours is the cheapest and best for us in the long run, we have sent you the order for fifty of your Mast Arms for the plant which we have erected for the City of Richmond, Va.

Wishing you every success we remain, Yours very truly,

SCHUYLER ELECTRIC LIGHT CO.,
By CHAS. E. DUSTIN, *Vice-President*



HARTFORD, CONNECTICUT, *November* 30, 1885.

T. H. BRADY, ESQ., New Britain, Connecticut,

Dear Sir.—I have used several of your Mast Arms and find that they work to perfection and also that they are a great improvement over the swinging lamp, or, in other words, a lamp suspended in the middle of the street between two poles. They are much less liable to get out of order, they are quite easy to take care of, and are quite an ornament. I can fully commend them to anyone.

Yours truly,
HARTFORD ELECTRIC LIGHT CO,
F. A. FRENCH, *Superintendent.*

NEW YORK, *January* 5, 1886.

T. H. BRADY, ESQ, New Britain, Connecticut,

Dear Sir—I am much pleased with your Mast Arms for arc lamps. They are simple in construction, low in price, and perfectly adapted for all purposes where projecting lamps are required.

Yours truly,
THE BRUSH-SWAN ELECTRIC LIGHT CO. OF NEW ENGLAND,
J. B. POWELL, *General Manager.*

BROOKLYN, NEW YORK, *December* 16, 1885.

MR. THOS. H. BRADY,

Dear Sir.—Some few months ago we substituted your Mast Arms for some swinging lamps (i. e, lamps suspended in the middle of the roadway), and find them a vast improvement.

We were troubled with the old style by carbons slipping by when the trimmer was pulling lamp out to its position. We find no such trouble with your Mast Arms, and are very much pleased with same.

Should be pleased to have you send anyone to inspect same.

Respectfully,
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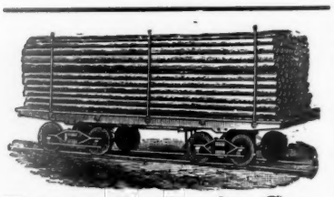

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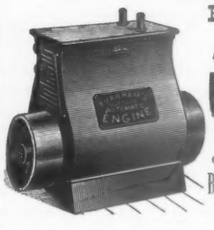

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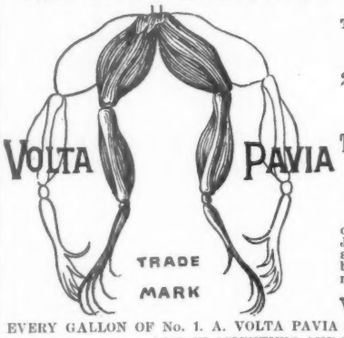

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SAWYER—MAN
vs.
EDISON.

EXECUTIVE OFFICES, MUTUAL LIFE BUILDING,
32 Nassau Street, New York,
March 23d, 1886.

The Consolidated Electric Light Company is the owner of the Sawyer-Man patents. These patents were issued in 1878, 1879 and 1880, except one of them, which was issued on the 12th of May, 1885, after a contest of five years in the Patent Office with Mr. Thomas A. Edison.

Referring to that contest, the Edison Company advertises that it did not involve the invention of the filament of carbon.

The fact is that on this identical point

MR. EDISON TESTIFIED IN 1883,

"*My mind was full of the fact that they were endeavoring to deprive me of the use of a filament of carbon;*" and referring to the magnitude of the interests involved, the distinguished

COUNSEL FOR MR. EDISON ARGUED

before the Commissioner of Patents in 1885,

"*The case at bar is one of the most important that has ever been before the tribunal of the Patent office. The pecuniary interests at stake are very great, and legal questions of much importance involved. It has been at issue since 1880, and thousands of folios of testimony taken.*"

The decision was that

"SAWYER & MAN

had the invention in a rude form as early as

MARCH, 1878,

and completed in September or October of the same year;" and that

"EDISON

completed the invention and reduced it to practice on or about

OCTOBER 22d, 1879,"

and a patent was issued to Sawyer & Man for the incandescent conductor for an electric lamp, consisting of carbon, made from a fibrous or textile material, having the form of an arch or loop.

Upon these patents of 1878, 1879, 1880 and 1885 suits are pending against leading electric light companies or infringement.

The Edison Electric Light Co. has advertised that it is the owner of the incandescent electric lamp, and has sent threatening letters to users of the Sawyer-Man system.

This Company, while declining to engage in such warfare, deems it proper to state that the Edison Company has never succeeded in obtaining a decree for the infringement of any of their said patents against any person or corporation:

First. Because the patents upon which the Edison Company has based its threats are for inventions proved, in so far as they are new and useful, to have been made by Sawyer and Man prior to October, 1878, for which patents, as above recited, were issued to them.

Second. Because the patents upon which the Edison Company based such threats, which could have had any possible value, were taken out in certain foreign countries for a short term prior to their issue in this country, which term has ended, and the patents have therefore expired.

This Company deems it proper further to state:

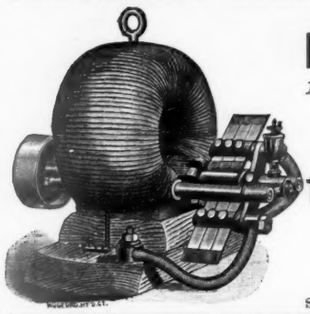
Third. That the Consolidated Electric Light Company will protect all the users of the Sawyer-Man system in the full enjoyment of its privileges.

Fourth. That the controversy in the Patent Office established Sawyer & Man's priority as inventors, and the suits pending in the Courts will determine Edison's liability as an infringer.

Fifth. That this Company requests those using and those contemplating the use of incandescent electric lights, who have been or may be deterred from purchasing lamps of the Sawyer-Man system, by reason of the threats of the Edison Company, to communicate the fact to this office.

THE CONSOLIDATED ELECTRIC LIGHT CO.

THE MATHER DYNAMO-ELECTRIC MACHINE.



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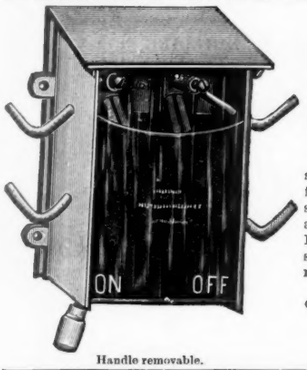

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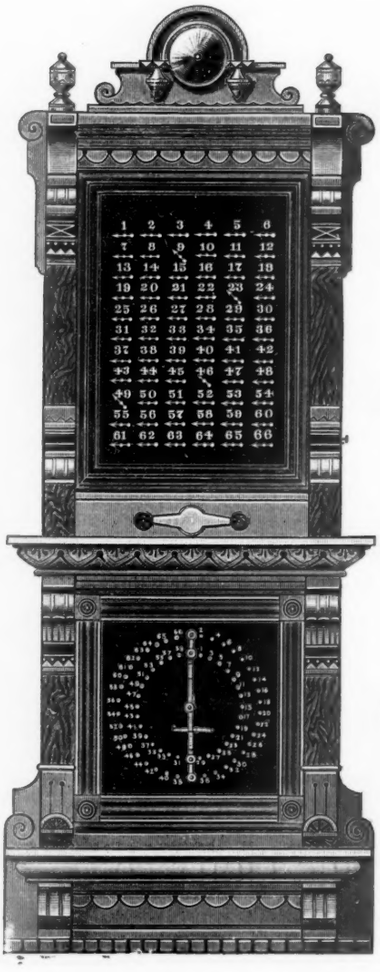

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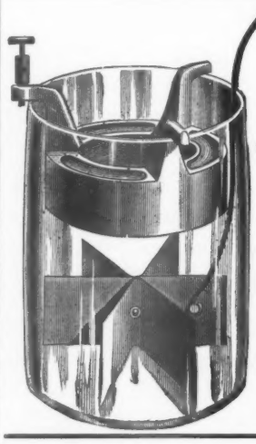

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General Superintendent Gamewell Police & Fire Alarm Telegraph Co.

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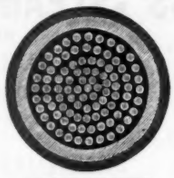

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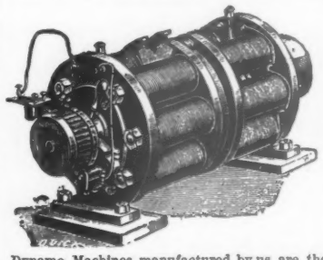

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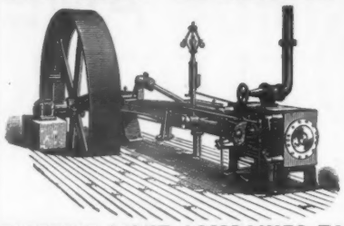

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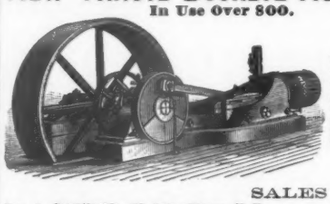

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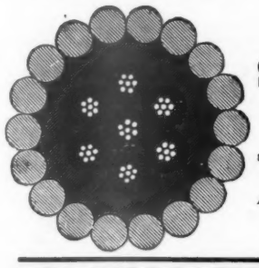

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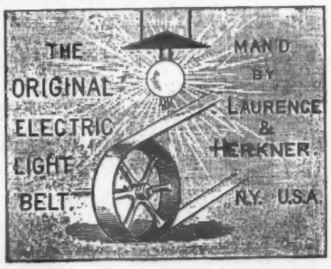

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